

## A-12 cancellation hits Fort Worth hard; up to 3,500 to be laid off

The Jan. 7 cancellation of the A-12 aircraft program will have widespread effects on Fort Worth Division.

Most important is the immediate loss of up to 3,500 jobs. About 150 positions are eliminated at Tulsa, Okla., where the aircraft was to be assembled. The remainder are at the division's Fort Worth facilities. The company had announced the likelihood of such layoffs on Dec. 20 if the A-12 were canceled.

The termination of the Navy's A-12 attack plane, which was being developed jointly by General Dynamics and McDonnell Douglas, will also close Fort Worth's A-12 business group. Fort Worth had reorganized into five business groups in December; the others are F-16 fighter, headed by Dain M. Hancock; Advanced Tactical Fighter, led by D. Randall Kent; Military Electronics, directed by John E. Vick; and Special Programs and Other Business, managed by Charles A. Anderson.

General Dynamics has pledged to make every effort to help find new jobs for A-12 employees. Fort Worth has established a Career Transition Center that offers counseling, open-job listings and long-distance telephone privileges. The company will work with federal and state

agencies to locate employment opportunities.

General Dynamics and McDonnell Douglas offered significant financial concessions to the government in exchange for restructuring the A-12 contract. General Dynamics will contest the default ruling under which the program was canceled. The company will pursue its rights for all work done and costs incurred on the program.

General Dynamics believes that A-12 development problems were the direct result of the government's insistence on a fixed-price contract for a program on the cutting edge of technology. The A-12 was to incorporate radar-evading stealth techniques, composite materials, fully integrated avionics and suitability for carrier operations. The plane was configured as a flying wing, smaller but similar in shape to the B-2 bomber.

Fort Worth will continue to build the F-16 Fighting Falcon and is a leading contender along with teammates Lockheed and Boeing for the Air Force's Advanced Tactical Fighter. The team has submitted its proposal for full-scale development. (See story on page 8.)

## Air Defense Systems cutbacks continue

Air Defense Systems Division will eliminate about 1,300 jobs between January and April. These layoffs are part of the nearly 3,000 positions the division previously said it would cut by 1992 because of declines in the defense contracting business and the necessity to meet competitive pressures.

Air Defense Systems employs about 8,000 people. Company officials estimate that by 1992 the division will have 5,200 employees remaining at its facilities in four states.

"We regret that these reductions are necessary," said Pete Wylie, division vice president-human resources and

administrative services. "Defense budget cuts and government procurement decisions are putting considerable pressure on our current programs. To remain competi-

### Life after a layoff ... pages 4, 5

tive, we must constantly re-evaluate our position and respond to these resources."

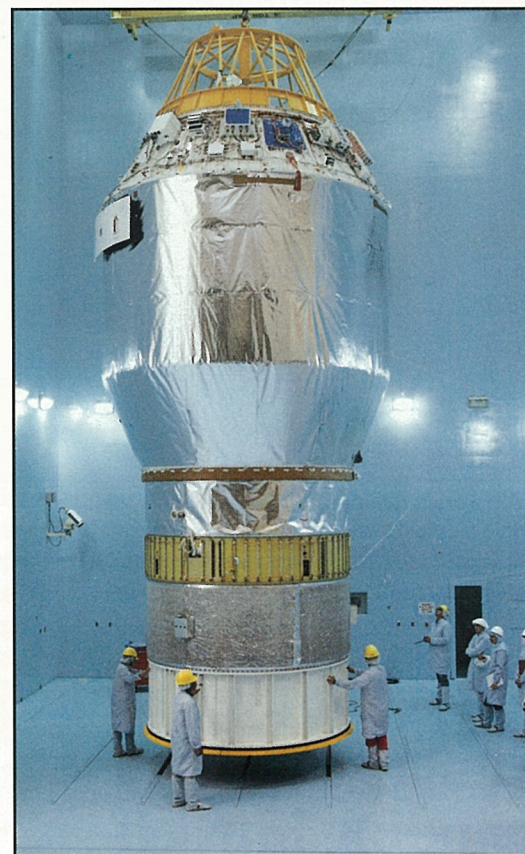
As part of its work-force reduction, the division has been voluntarily providing employees who are laid off with essentially the same benefits called for under the

(Continued on page 5)



**Super sealifter.** Military supplies and equipment are readied for loading onto the *1st Lt. Baldomero Lopez*, a maritime prepositioning ship. The ships, built by General Dynamics and operated by American Overseas Marine Corp., were vital in quickly supporting Operation Desert Shield. (See story on page 6.)

## News Briefs



JOHN BRITAIN

The wide-body Centaur

## First 'fat' Centaur goes to Air Force

Space Systems Division has begun processing the first in a more powerful series of Centaur upper-stages for the Air Force.

The vehicle was delivered to Cape Canaveral Air Force Station, Fla., after rollout ceremonies on Dec. 10 in San Diego.

The vehicle will be mated with a Titan IV booster. Titan IV/Centaur provides heavy-lift capability to the Air Force for payloads previously planned for the space shuttle. Titan IV/Centaur can place 10,000 pounds into geosynchronous orbit 22,300 miles above Earth.

The wide-body Centaur is 29 1/2 feet long and 14 feet in diameter. It provides 33,000 pounds of thrust. It carries 50 percent more propellant than the original 10-foot-diameter Centaur D-1A used with Space Systems' Atlas booster.

Space Systems is under contract to Martin Marietta to build 15 wide-body Centaurs.

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## Nine finish career programs

Nine employees recently graduated from two career programs at Air Defense Systems Division. Sheri Kushner completed the administration career development program. C.T. Bien, Anita Evans, Bridget Gomez, Colleen Hope, Karen Logue, Vicky Pennisi, Beth Wahl and Julia White finished the career enhancement program.

The nine employees rotated among various departments during the two-year programs to learn how the division functions. The programs "are helping to prepare a totally competent future management team," said General Manager Mike Keel.

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## EB to build 18th Trident

The Navy has awarded a \$765 million contract to Electric Boat Division to build the 18th Trident ballistic missile-firing submarine. The submarine will carry hull number SSBN 743.

Delivery is scheduled for August 1997. Electric Boat has built all of the Navy's Tridents.

TOM RULE





John Hendrick (standing) watches Gary Pinson, a disabled employee with Ouchita Industries, test Camden bags for possible reuse. The device Pinson uses flashes green for bags that test positive and red for those that can't be reused.

## Camden buyer makes winners of everyone — including himself

It's John Hendrick's job to find suppliers for Air Defense Systems Division's facility in Camden, Ark.

It's also his pleasure.

Hendrick and his buying group specialize in locating qualified small disadvantaged businesses, firms that employ less than 50 people and are owned by minorities. Many of these firms hire the disabled. "It gives you a good feeling when you can send work to these companies," Hendrick said.

Hendrick, a purchasing agent, must feel good quite often. He was instrumental in Camden making 169 purchase orders from small disadvantaged businesses totaling nearly \$1 million in 1989. His work to make winners of others made a winner of himself when he recently received a General Dynamics Extraordinary Achievement Award as Corporate Small Disadvantaged Business Buyer of the Year.

Monty Dickinson, staff vice president-material, traveled to Camden to present this major award. Plant Manager Gordon Webster, Director of Material Lowell Edwards, and Hendrick's entire department attended the presentation.

One of Hendrick's award-winning efforts was to invite a group of small disadvantaged businesses to the Camden facility to show them the kinds of work they could supply to Camden. That led to many purchase orders, including one for \$250,000 in janitorial services from a company in Little Rock, Ark. All of these contracts have been satisfactorily completed.

But Hendrick is proudest of his ties with Camden-based Ouchita Industries, a sheltered workshop for the disabled. Hendrick, together with Camden facility engineer Tim Johnson and representatives of 3M Co., worked out a system with Ouchita to test static shielding bags for reuse. The bags contain electronics components for circuit boards Camden assembles.

Camden had been discarding the bags after removing the parts. But last year Ouchita reclaimed 74,600 bags — 92 percent — for reuse by Camden. The remaining 8 percent were sold to a company that recycles refuse.

The program has helped the environment, saved General Dynamics \$13,000 and provided work for the disabled. The National Association of Rehabilitation Facilities has contacted Hendrick about adapting the bag-testing system to other firms that employ the disabled.

The meaningfulness of this kind of work is illustrated by Gary Pinson, an Ouchita employee whose legs are so weak that he moves around on his knees with the aid of a walker. "I'm glad to have something worthwhile like this to do," Pinson told Hendrick.

"It's very rewarding to hear things like this," Hendrick said. "I think it proves that big business can have a heart."

■ Dave Lange

## Tuskegee, General Dynamics give lift to National Aero-Space Plane

The materials to develop the X-30 National Aero-Space Plane could well be identified from research studies led by Tuskegee University and including General Dynamics.

The government recently awarded a two-year, \$810,000 contract to Tuskegee for researching various materials for the X-30. The vehicle will take off like a plane and fly directly into orbit.

General Dynamics, one of five contractors teamed to design and construct the X-30, helped the Alabama university prepare its contract proposal. General Dynamics will be a subcontractor to Tuskegee for tasks valued at about \$100,000.

General Dynamics also serves as a mentor for Clarkson Engineering, a minority-owned Houston firm that also will be a subcontractor to Tuskegee. Clarkson Engineering has performed X-30-related testing under previous contracts totaling about \$250,000.

Tuskegee has academic programs in aerospace sci-

ence and chemical, electrical and mechanical engineering. The school gained fame during World War II when it trained black pilots for the military.

Professors at Tuskegee will identify composite materials that can sustain operation under significant structural loads at very high temperatures. Researchers will also focus on materials that show short-term high-temperature stability and resistance to thermal shocks.

The contract enables the school to add 12 students to the 20 already involved in materials research. The contract will also improve Tuskegee's multimillion-dollar research lab. Composite materials research at Tuskegee, funded mostly by the Office of Naval Research, the Air Force, NASA and the Strategic Defense Command, already exceeds \$1.4 million.

Other universities performing government-funded X-30 research include Harvard, Stanford, Texas, Carnegie-Mellon and the Virginia Polytechnic Institute.



Pete Himmelberg compares a plastic model of an F-16 forward fuselage to the computer-based drawing from which it was created.

## Model-making made easy at Fort Worth

The age of plastics gave birth to a novel arcade attraction, a coin-operated machine that allowed anyone to watch while it molded a model car or airplane. The devices enjoyed brief popularity at carnivals and bowling alleys in the late 1950s.

The technology was primitive by comparison, but the basic concept is similar to stereolithography. This high-tech process is used by Fort Worth Division engineers to make detailed models directly from computer-based designs of aircraft shapes and components.

In both cases, the product is an automatically formed, made-while-you-wait plastic replica of a much larger article. The difference is that stereolithography links the original computer-based design data to a scanning laser beam to create a three-dimensional model that is geometrically correct on its interior and exterior surfaces.

"Starting with a drawing on a computer screen, we can transfer computer data directly into a precisely scaled three-dimensional model," said Pete Himmelberg, an engineering displays employee who has been operating the system for several months. "The technique has a large potential to save time and money in the production of some types of test models."

Fort Worth began studying stereolithography about four years ago when George Kaler, then manager-computer-aided engineering, told Engineering Chief Bob Lynch about the process. Lynch linked the technology with the advanced computer-aided design system used by Fort Worth's advanced design section.

The division purchased and installed a machine in the Aerospace Technology Lab to investigate better ways to build wind-tunnel models. The project has produced an

assortment of models and parts. Some have already been used in experimental wind-tunnel testing. The process has been linked with the structures and design department's data base.

The starting point in the process is a three-dimensional, computer-based mathematical model of a part or an aircraft design. The data is transferred to a special computer that automatically calculates cross-sectional slices, each about one ten-thousandth of an inch thick, through the model. The sections are fed into a 3D Systems Stereolithography machine that consists of a control computer, a vat of liquid plastic, an elevator system and a laser.

The machine's computer draws the sliced sections one at a time with a laser that solidifies the layers on the surface of the liquid plastic. The elevator lowers the hardened layer, allowing the laser to draw the next one on top of it, and repeats the process until the article is complete.

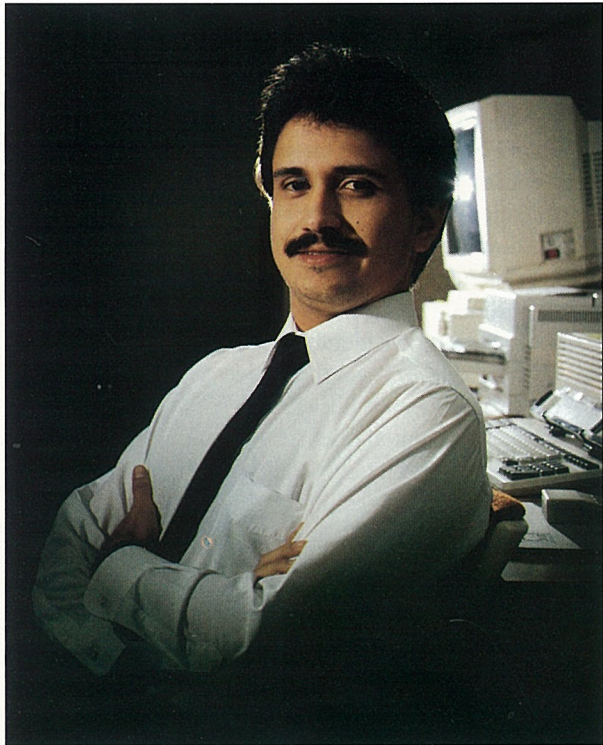
The stereolithography process takes about a day for most models, depending on the complexity of the shape. This is still considerably faster than model-making with conventional hand-building techniques.

Objects are made that fit inside a 10-inch cube. Larger items are completed by assembling sections. The final product has characteristics similar to Plexiglas and can be painted or polished.

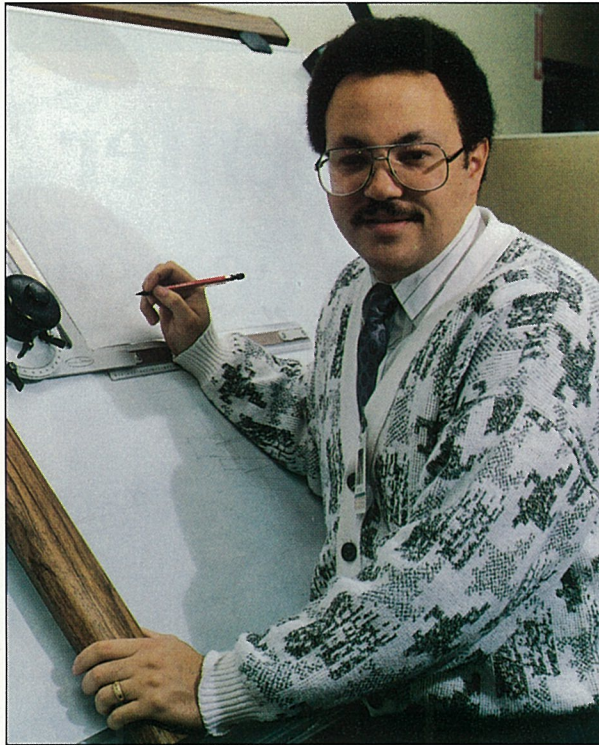
The main advantage of the system is the extreme detail it can produce. "What you see in your computer-model image is what you build," Himmelberg said. "This gives the engineer an extra opportunity to catch and fix discrepancies that may not be apparent in the drawings."

■ Joe Stout





Alberto Salcedo



Martin Howell

## Academic program betters careers for minorities: Just ask GD pair

When Alberto Salcedo and Martin Howell were youngsters, they didn't dream of becoming engineers. But thanks to the University of California at Berkeley's Mathematics, Engineering and Science Achievement program, today both are pursuing careers as engineers with excellent opportunities to grow with General Dynamics.

The 20-year-old program prepares California minority high school students to major in math-related fields in college.

Salcedo, an avionics engineer working in computer-aided design at Space Systems Division, learned about the program while attending San Diego High School.

"I was the first in my family to get a degree," Salcedo said. "I am a first-generation Hispanic in the U.S. My parents came from Mexico and, like most immigrants, were concerned more with survival than with better opportunities for their children."

However, Salcedo graduated from high school and entered San Diego State University to study math with the help of the program. He later switched majors and earned his degree in engineering.

"Now I enjoy getting out to schools to tutor students and encourage them to continue their education," he said. "The dropout rate among Hispanics is high. For every 50 students who enter college, only one graduates. Unfortunately, in many cases the lack of money and education prevents parents from giving their children the right advice and the encouragement needed to pursue any career."

"One of the purposes of groups like MESA is to change attitudes and try to make Hispanics understand the opportunities open to us."

The program is helping minority students beat the odds. More than 90 percent of high school seniors in the

program are taking courses such as trigonometry, calculus or chemistry. Some 75 percent graduate high school with a B average or better. And where only 13 percent of minority students in California enroll in four-year colleges, 73 percent of students in the program have enrolled.

"The MESA organization was a key to why I completed my studies at the University of California-Berkeley," said Howell, who graduated with a bachelor of science degree in mechanical engineering and is a senior engineer at Air Defense Systems Division.

Howell joined Pomona Division in 1985 and transferred to Valley Systems Division. The two merged into Air Defense Systems in August. Howell continues to work at the former Valley Systems facility in Rancho Cucamonga, Calif.

Howell cited several of the program's services that were instrumental in helping him obtain his degree — a 2 1/2-year scholarship, tutoring, counseling, job fairs and resume workshops.

In 1989, Howell was selected to participate in the division's two-year career enhancement program for women and minorities. The enhancement program identifies promotable minorities and women and broadens their career paths. Howell called his participation "an opportunity to broaden my experience outside the design area and to enhance my future at the division."

The Mathematics, Engineering and Science Achievement program helped put Howell and Salcedo where they are today. The program can do the same for others. "I tell students the money's out there," Salcedo said. "I say, 'Would you rather be making \$4.50 at a fast-food place or \$20 an hour as an engineer?'"

Howell put the issue simply: "I would not have done as well as I have without MESA."

## Harlingen focuses full-time on space

General Dynamics' facility and its employees in Harlingen, Texas, have been transferred from General Dynamics Services Co. to Space Systems Division. Harlingen will concentrate completely on production and assembly of hardware for Space Systems.

There will be no employees cut at Harlingen.

"Harlingen has matured to a point where it has evolved into a highly effective manufacturing facility," said George P. Psihas, corporate vice president and general manager of General Dynamics Services Co. "It makes good business sense to take advantage of those capabilities and resources and direct them to full-time production of reliable space hardware for the Atlas and Titan/Centaur launch vehicles."

General Dynamics Services Co. opened the Harlingen facility in 1987 to work on an aircraft modification program. Since completion of the program in mid-1988, the 500 employees at Harlingen have been working on a

variety of components for the Atlas booster and the Centaur upper stage.

"This consolidation will provide added capability for Space Systems and improve our competitive posture as we pursue new opportunities in the launch services market," said Alan M. Lovelace, corporate vice president and general manager of Space Systems.

Some of the components produced at Harlingen for the company's launch vehicles include the thrust structure, pod doors, interstage adapter, equipment module, stub adapter, payload adapter and payload fairing.

Space Systems, which is headquartered in San Diego, is committed to building 60 Atlas launch vehicles for commercial and military markets. The company holds 26 orders for commercial launch services and is also under contract to build and launch 10 Atlas rockets for the Air Force.

## Users give EM/OS good and bad marks in company survey

Users of the Electronic Mail/Office System gave mixed grades to EM/OS in a recent survey, according to Rik Drummond, corporatewide electronic mail program manager.

Twenty percent of General Dynamics' 15,000 EM/OS users were polled on-line to determine how the system is used and how it can be improved. Responses came from all organizational levels of the company. Drummond's office, based at Data Systems Division's Central Center in Fort Worth, sponsored the companywide survey.

"A majority of the responses conveyed that EM/OS is an important and vital tool for day-to-day communications within General Dynamics," Drummond said. "Survey findings included praise for the system's user friendliness, capabilities and applications."

Users are satisfied with the capability to send text quickly and easily regardless of the message's destination or time zone. Users view information such as the Daily News Summary, prepared by the public affairs office in Washington, and the GDFW NEWS, a division-specific news summary produced in Fort Worth, as important.

The survey revealed several usage trends:

- General users state that they receive a weekly average of 30 messages, print an average of 13 messages, and send or forward an average of 12 messages.
- When only directors or above are counted, the numbers increase to weekly averages of 69 messages received, 50 printed, and 34 messages sent or forwarded, revealing a significant increase in usage among executives.
- At all levels, users said that only 14 percent of the electronic mail they receive is unwanted, in contrast to 24 percent unwanted paper mail.

The No. 1 reason users print messages was for working copies or action reminders. The No. 1 benefit of EM/OS was perceived as fast communication. Ninety-eight percent said EM/OS was either helpful, very helpful or extremely helpful in performing their jobs. Eighty-eight percent said EM/OS is available for use all or most of the time when they need it.

Users suggested some areas for improvement, such as user access, information flooding and lack of training. In response, the information resource management departments at each EM/OS site have put in place an action plan to improve EM/OS.

"The key themes in enhancing our use of the EM/OS communications tool are user feedback and user responsibility," Drummond said. "Each of us as EM/OS users must take responsibility for effective EM/OS communications by giving constructive feedback on the kind, type and amount of information we wish to receive from our peers and subordinates."

"The survey indicated we must individually evaluate and question large distribution lists and the repeated forwarding of possibly non-essential memos. We must write clear, concise messages taking care to enter a clear subject."

"We must continually apply common sense in selecting communication methods," Drummond continued. "We should appropriately choose between an EM/OS memo, the phone, a paper memo, a face-to-face meeting or a videoconference. We should choose the best fit for the circumstances. We should not use EM/OS to avoid resolving an issue, to highlight a favorite soapbox issue, or to conduct an EM/OS war."

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Manager of Internal Communications: Dave Lange

Contributors: Julie Andrews, Dan Barrett, Pete Connolly, Graham Gavert, Donald Gilleland, Myron Holtzman, Jerry Littman, George Livesay, Bruce McIntosh, Pat Moritz, Karl Oskoian, Jack Price, Tom Rule, George Salamon, Chris Schildz, Eric Solander, Peter Stamos, Joe Stout, Joe Thornton.



By Dan Barrett

# Career Transition Center helps employees to cope with life after a layoff

*These stories highlight the efforts of one division to help laid-off employees. Similar centers are operating or are planned at several other General Dynamics locations.*

Employees laid off last fall from Electric Boat Division are finding out there is life after EB.

A total of 599 employees are getting counseling, as well as clerical and administrative support for their job searches, at the division's Career Transition Center near the main shipyard in Groton, Conn. The center was established in conjunction with the layoffs, which occurred as the division adjusted its work force size to its business level. A similar center is at the division's Quonset Point, R.I., facility.

"Anyone who's laid off goes through certain stages of anger, frustration and sometimes depression," says Rich Taylor, who runs the center. "So far, the reactions have been pretty much as we expected."

The center's eight-person staff strives to help employees survive those stages and move on to develop practical job-finding skills.

"First we talk about their worries or their anger and then help them focus on themselves and their professional accomplishments," Taylor says. "It's critical that they look beyond what's happened to them and focus on what's ahead."

Division counselors with extensive recruiting experience instruct employees in interview techniques and networking, as well as how to compose written job inquiries and resumes.

It's vital that employees don't sell themselves short, Taylor says. "Sometimes they don't realize how good they really are," he says. "We try to bring out their strong points — to get them back on track on a real positive note."

For those

with difficulty coping, representatives from the division's employee assistance program are on hand at the center.

Affected employees can better cope simply by being aware that layoffs trigger powerful emotions that should be acknowledged, according to Ken Shortman, division employee assistance program coordinator, and Debbie Shapiro, who works for the outside firm that provides the program's services.

"People go through a grieving process," Shapiro says. "First there's denial — 'I can't believe this is really happening to me' — and that's followed by anger. These are very healthy emotions. People need to understand that and deal with them. These feelings are a normal response to a major loss in their lives."

Adds Shortman: "Some people try to deny these emotions. They don't think they should be angry or feel sorry for themselves. All that does is exacerbate the initial emotions."

It's typical for laid-off employees to feel powerless after getting their notices, Shortman and Shapiro say. Counteracting that, however, are the staff and resources available at the Career Transition Center.

"Employees are using the center to gain greater mastery and control over their lives," Shapiro says.

In the end, stresses Taylor, the success of each job search is up to the individual employee, with a little help from friends. "The networking system we're encouraging employees to use is only as good as the people in the network," he says. "If anyone at EB or anywhere throughout General Dynamics can help us get leads on jobs through their outside contacts, we'd greatly appreciate it. We'll take all the help we can get."

Glenn Miller is using the Career Transition Center to look for jobs in quality assurance management and quality assurance audits.

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When Bob Arruda was knocked on his heels by the shock of his layoff, the counselors at Electric Boat's Career Transition Center put him back on the right track.

"I didn't expect the layoff at all," says Arruda, a ship superintendent who has worked at the division for eight years. Since getting the word, though, Arruda's outlook has improved considerably.

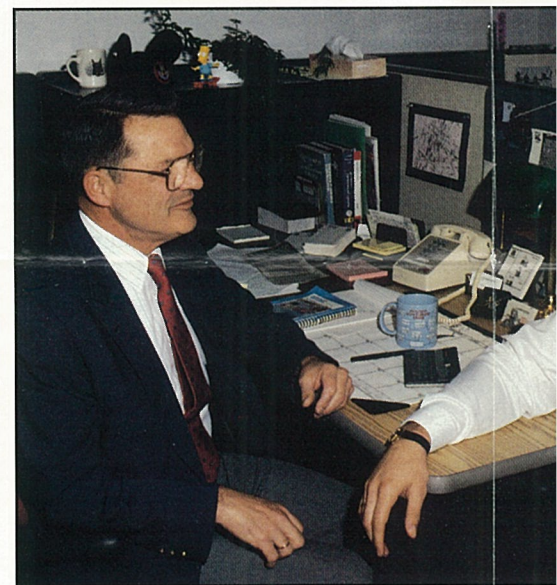
"When you first get the notice, you're lost," he says. "But there's been a big change." Arruda attributes that change to the initial orientation session the center's staff and others conducted for all laid-off employees. "The counselors got us feeling good about ourselves almost immediately," he says.

"It wouldn't have been as helpful emotionally if the division had given us two months pay and said 'see you later,'" says Arruda. "There are some people who've been here for 30 years and haven't had an interview since they began working. Without the center, they wouldn't know where to start."

Arruda has used the center to polish his resume and make telephone job inquiries. He has honed his interviewing skills, using the center's video playback capability for critiques by the counselors. "They know what makes a good interview and that's helped me out," he says.

"I honestly think the counselors do care," he says. "The center closes officially at 5:15 p.m. But a lot of times people have been here until 7. If you need them, they'll stay to help."

"They do care and they are trying. But there's only so much they can do. In a job search, you're going to get out of it just what you put into it."



Charley Blount (left) meets with Scott Wilderman at the Career Transition Center.

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Glenn Miller says he came to Electric Boat as a professional, and that's the way he'll leave. After receiving his layoff notice, he told his supervisor that if there were any jobs to be done, he'd do them — right up to the end of his 60-day notification period.

A procurement quality-assurance analyst who joined the division three years ago, Miller has taken the same even-keeled, businesslike approach to finding a new job.

The layoff notice itself was not a complete surprise to Miller. "The group I work for is basically overhead and I had the least seniority," he says. "I figured if there was going to be a cut in our department, I would be the one."

Miller was similarly prepared for his job search with an updated resume. It wasn't as good as it might have been, though, which is where the Career Transition Center entered the picture. "My counselors provided their expertise and it's made all the difference — with their help I've had much better results with my resume," he says, noting that he's already landed several interviews with his improved version.

Miller, who is looking for jobs relating to quality assurance management and quality assurance audits, has been spending about eight hours per week at the center, taking advantage of the newspapers and periodicals, long-distance telephone lines, and fax and word-processing services. "It's become a full-time job in itself," he says.

"For someone who hasn't had to look for a job in 10 or 15 years, this center offers the best of everything," Miller says. "And you can't beat the counselors."



Bob Arruda checks the help-wanted ads in periodicals available in the Career Transition Center.



PHOTOS BY ART AVERY

## England appointed Land Systems GM

Gordon R. England has succeeded Robert Truxell as corporate vice president and general manager of Land Systems Division. Truxell retired Dec. 31.

England had been Land Systems vice president-research and engineering since coming to the division in 1986. He began his career with General Dynamics at Fort Worth in 1969. He served as avionic project manager for the F-111 fighter-bomber and the F-16 Fighting Falcon. He later worked as director-avionic systems with responsibility for systems design, development and installation of avionics for all Fort Worth programs.

At Land Systems England was the architect of the M1A2 Abrams tank and other research and development projects until receiving his new assignment.

Truxell had headed Land Systems since joining General Dynamics in 1983. He spent 40 years with General Motors Corp., the last two as vice president and general manager of its Truck and Bus Manufacturing Division.

## Air Defense Systems receives 70 percent of Standard contract

A recent Standard Missile contract awarded to Air Defense Systems Division "is recognition of our ability to deliver a quality product on time at a competitive rate," according to Jerry Lockard, vice president and program director-Standard Missile.

In the latest competition with Raytheon Corp., Air Defense Systems received 70 percent of the fiscal year 1990 buy of Standard Missile-2 Block III, a surface-to-air weapon. Raytheon was given the remainder.

The \$121.2 million contract from Naval Sea Systems Command calls for the division to produce 497 Standard Missiles beginning immediately and continuing through 1992. The Navy awarded a \$64.9 million contract to Raytheon for 213 missiles.

The awarding of the contract, said Lockard, means the division will continue to produce the missile. He also pointed out that the division is the design agent for Standard Missile-2 Block III.

"Receiving 70 percent of the contract shows that the division can successfully win contracts," Lockard said. "The award also shows customer confidence in our division as presenting the 'best value' in producing this system."

Standard Missile-2 Block III is a medium-range system that incorporates low-altitude performance enhancements. Deliveries of this version began in 1989.

Standard is a family of missiles providing anti-air defense for the fleet. An all-electric, supersonic, tail-controlled, multimode missile, its modular design uses existing investments in ships, launchers, radar, fire control systems and logistics support. It is operationally deployed on 160 combatants of the U.S. Navy and eight allied navies.

■ Jerry Littman

As a member of management at Electric Boat, Charley Blount knew there was a statistical probability he would be laid off as part of the division's process to streamline the organization, reduce management layers and decrease overhead and support costs.

He even prepared his family for the possibility. Yet when the bad news came, it hit him hard. "I was correct in anticipating it, but it was still painful," says Blount, chief of engineering for *Seawolf* logistics. "It's a tremendous shock to your ego and sense of self-worth."

Helping restore Blount's confidence and job search was the Career Transition Center, especially the first orientation session.

"The key point that was brought out was that you're not a bad person...you haven't done anything wrong," Blount says. "You're not being terminated for cause, you're being terminated as the result of a business decision. And for Electric Boat, it's a very healthy business decision. We've got to become more competitive."

Blount is making himself more competitive in the job market by conducting a vigorous search for engineering and academic jobs. "For a person of my age and background, finding a job is full-time work, with query letters, thank-you notes and networking," he says. "It involves a lot of time."

The center's administrative and emotional support have made a difficult task easier to carry out, Blount says. "I have nothing but the highest regard for the counselors and the support staff," he says. "They've been extremely responsive."

On her last job search, Jeannie Conway spent \$2,000 for postage, telephone calls, resume preparation and odds and ends.

That was a year ago. After a lengthy search, Conway landed a job as a clerk in the manufacturing engineering department at Electric Boat. But seven months later, Conway lost that job.

"I had the least seniority of anyone in my department, so I kind of expected it," says Conway, a union member. "But I was hoping it wasn't going to happen. When I got the word, I was devastated - I thought, 'oh, boy, here we go again.'"

Conway nonetheless gathered herself quickly. "The Career Transition Center was a godsend," she says. "Setting it up was probably the best thing EB could've done for the laid-off workers."

"The resume service helped me and the literature was excellent. But I think the most valuable thing for me has been the phone. I can pick it up and call anywhere and not have to worry about the cost. That's worth a lot."

With six interviews already under her belt, Conway noted her job search has been easier this time around. "I've been laid off and I might not have a job, but EB has given me the opportunity to find a job," she says. "I have a choice. I can be negative and bite off my nose to spite my face or I can go in, use the center and do the best I can do."

Jeannie Conway (left) discusses her job search with Linda Morales, a counselor at Electric Boat's Career Transition Center.



## 1,300 jobs cut

(Continued from page 1)

Worker Adjustment and Retraining Notification Act. Since last August, employees have received 60 days lay-off notification. In addition, a Career Transition Center was established at the division's Pomona facility. The center provides a full range of services, including personal job search counseling, help with resumes, job listings, phone services and training programs. The company also offers a series of job search workshops conducted by the outplacement consulting firm of Drake Beam Morin, Inc.

Because the rate of layoffs may exceed more than 500 employees at one facility over a 90-day period, the company has elected to notify the government and union officials, as called for by the Worker Adjustment and Retraining Notification Act. Under the act's provisions, additional federal and state assistance becomes available to help employees who are laid off.



# Ethics program begins sixth year

The company's ethics program received a record 6,000 communications in 1990. The program is beginning its sixth year of "continuing its positive role in the daily operations of the company," according to Kent Druyvesteyn, vice president-ethics. "Experience over the past five years confirms that most employees want to do what's right and that pride in their work and a sense of self-esteem are important motivators."

The ethics program is built on the commitment to ethical conduct and fair play that each individual employee at every level in the organization brings to the job. The program makes this commitment explicit through the Standards of Business Ethics and Conduct and through the open lines of communication maintained by the ethics program directors and also by the ombudsmen. The ethics directors and the ombudsmen work together closely.

The communications to ethics directors usually involve simple questions.

Some communications concern possible misconduct. These are carefully investigated and, when the facts are substantiated, appropriate sanctions are levied by management. There were more than 250 sanctions ranging from a warning to discharge in 1990.

The current directory of ethics program directors and their phone numbers accompanies this story. If a director is unavailable, the caller may choose to call again or leave a message for a call back. Directors attempt to acknowledge all calls within 24 hours. If a call is not returned by a director within a day, the caller should feel free to call again.

## Ethics directors, hot line numbers

(\* = hot line numbers)

### Corporatewide

St. Louis - Kent Druyvesteyn 800-433-8442 \*  
P.O. Box 50263, St. Louis, MO 63105

### Air Defense Systems

Rancho Cucamonga - Bill Coleman 714-945-7772 \*  
Camden - C.R. (Bob) Ingels 501-574-4446 \*

### AMSEA/Quincy

Quincy - James F. O'Hearn 617-786-8300 ext.702

### Cessna

Wichita - Mark Bagley 316-946-7880 \*

### Convair

San Diego - John C. Barrons 619-573-8120 \*

### Corporate Office

St. Louis - Kent Druyvesteyn 314-889-8456 \*  
Washington - William L. Smith 703-553-1343 \*

### Data Systems

St. Louis - William E. Tucker 314-851-8906 \*  
Camden - John Brown 501-574-4220  
Fort Worth - D.G. (Dee) Chamberlain 817-762-8014 \*  
Newport - Edwin A. Coolbaugh 401-848-8650  
Norwich - James M. Cleary 203-823-2700 \*  
Omaha - Bill Mavity 402-291-9234  
Pomona - William E. Kirke 714-868-6620 \*  
San Diego - John W. Withers 619-547-4682 \*  
Sterling Heights - Raymond J. Dinser 313-825-8807

### Electric Boat

Groton - William A. Miller 203-433-8000 \*  
Avenel - Robert L. Wylie 201-636-0155 \*  
Charleston - Cheryl A. Lyons 803-553-4850 \*  
Quonset Point - Roland J. Plante 401-268-2705 \*

### Electronics

San Diego - W.P. (Bill) Shine 619-573-7384 \*

### Fort Worth

Fort Worth - John L. (Jack) Shultz 817-777-1400 \*  
Abilene - Robert E. Davidson 915-691-2131 \*

### Freeman United Coal

Marion - James T. Ryan 800-637-0399 \*

### GD Services

St. Louis - Doris Chiste 314-851-8997 \*  
Detroit - Anne M. Tokarz 313-244-7104  
Fort Worth - C.E. Geyer 817-367-1406

### Land Systems

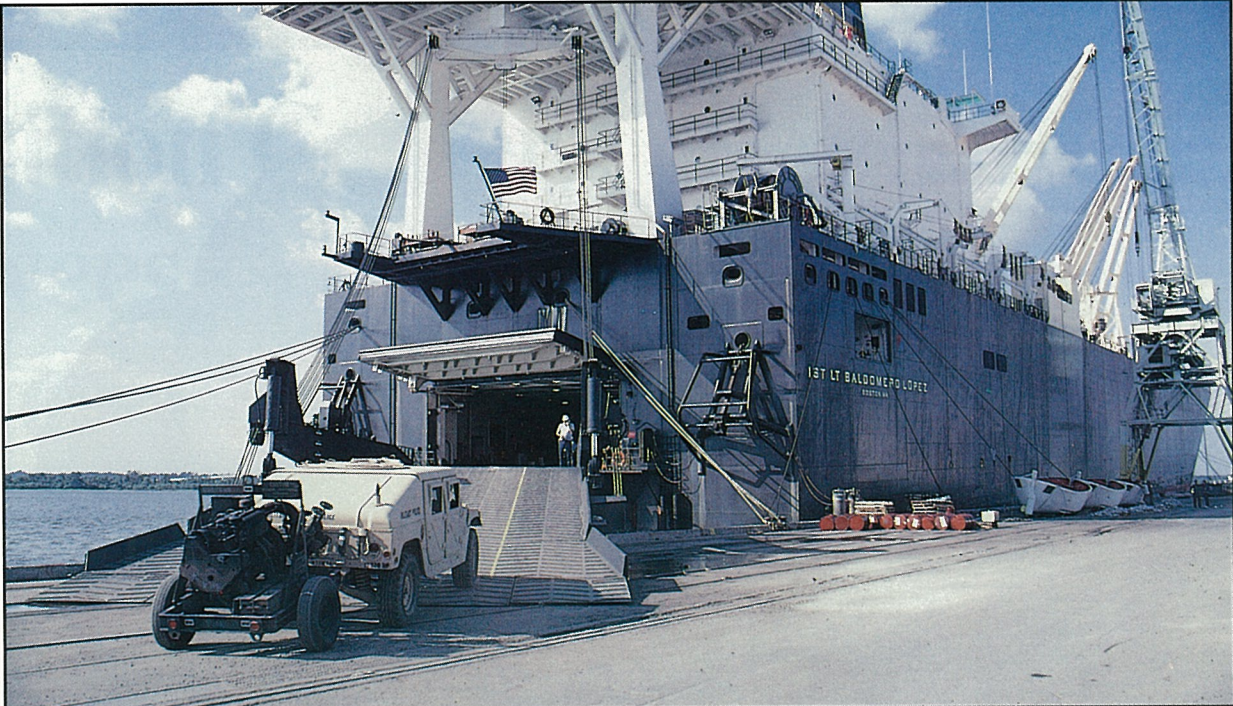
Detroit - Charles J. Stieber 313-825-5888 \*  
Lima - George E. Nolan 419-221-8555 \*  
Scranton - Richard W. Gray 717-876-5797 \*

### Material Service/Marblehead Lime

Chicago - Edward K. Wilverding 800-225-0926 \*

### Space Systems

San Diego - Alda O. Jorgenson 619-573-8367 \*  
Cocoa Beach - Howard F. Biegler 407-730-0185 \*  
Vandenberg AFB - Ray Degen 805-865-8072 \*



Equipment rolls onto an AMSEA maritime prepositioning ship.

# AMSEA's ships star in Operation Desert Shield

One phase of General Dynamics' contribution to Operation Desert Shield already has been hailed as an unqualified success.

After five years of preparation, the first "real-world" deployment of the American Overseas Marine Corp.'s prepositioning ships cruised through their mission without a hitch. They moved tanks, supplies and some troops into Saudi Arabia in support of the Marines, only days after Iraq's invasion of Kuwait.

The speed of the maritime prepositioning ships' mission was called a critical maneuver by military personnel in the Persian Gulf.

"This has validated the maritime prepositioning ship concept thought up in the early 1980s," said Leland Bishop, president of AMSEA, a General Dynamics subsidiary. "This is the first in-theater operation that the program has actually experienced and from everyone's viewpoint, it was the real star of Desert Shield and the basic support during the first 30 days."

Maritime prepositioning ships are mobile depot ships for Marine Corps heavy equipment and supplies that support rapid deployment of Marine amphibious forces.

The viability of the concept became more apparent when the deployment of military sealift and material wasn't completed until more than three months later.

"When the history of Desert Shield is written, the sealift portion will be viewed as a tremendous success," said Vice Adm. Francis Donovan, commander of Military Sealift Command in an interview with *Defense News*.

Four AMSEA ships make up Maritime Prepositioning Ship Squadron Three, which was based in Guam at the time of the invasion. Within two weeks, the ships sailed to theater with enough equipment to support a Marine expeditionary brigade (about 16,500 marines) for 30 days. The tanks, trucks, artillery, tracked vehicles, ammunition, medical items, fuel, food and drinking water kept the troops supplied until the regular sealift began taking effect.

"The squadron's 7,000-mile, no-notice, high-speed transit was demanding of both the ships and their crews," Rear Adm. S.S. Clarey wrote to Bishop. "Their on-time arrival and delivery of combat equipment in-theater is vivid proof of the high degree of material and personnel readiness that AMSEA has helped maintain."

AMSEA's fifth ship, which was assigned to Maritime Prepositioning Ship Squadron One in the Atlantic, has since been ordered to the Saudi area.

"With no prior warning, we had to change our logistic support," said Bishop. "Our ships were engaged in various exercises, but when President Bush put out the notice to head for the Persian Gulf, we were ready."

The AMSEA ships, with a civilian crew of 30, traversed the choppy waters and were off-loading cargo in only 15 days. Each ship also carried about 200 Marine and Navy personnel.

Bishop said AMSEA ships, designed and built by General Dynamics' now-defunct Quincy Shipbuilding Division, were constructed to a new General Dynamics design in the early 1980s. While the government was requesting bids to convert existing ships for prepositioning purposes, AMSEA proposed a completely new ship design. Not only did Quincy win a five-ship award,

but it built them cheaper than the competing conversion design.

"Our ships are more flexible," Bishop said. "We can off-load equipment in any sequence, which is advantageous to the Marines. Maintenance also can be performed while our ships are under way because of the large ventilation system."

Temperature and humidity can be controlled within the holds to support long-term storage of equipment and supplies, maintaining them in like-new condition.

The ships - all named after Marine Corps Medal of Honor winners - and their crews continue to support Desert Shield. These operations include carrying cargo, acting as communications centers for hospital ships and providing workshops to support tank modification.

Another one of AMSEA's functions is to perform as ship's manager on 12 Ready Reserve Force ships, activating them over a period of five days when directed. The force consists of two aviation logistics support ships, which maintain Marine aircraft, and 10 cargo ships.

"The two aviation logistics support ships were activated in the Persian Gulf in September and six cargo ships were activated by year's end," Bishop said. "The remaining four ships will be made in a ready state to support needs that may arise in January."

AMSEA employees and the military personnel aboard ship performed superbly in all operations for Desert Shield, Bishop said.

"The combination worked very successfully as a team," he said. "Vice Adm. Donovan went aboard three of our ships and called to tell me how well our personnel performed."

In addition to the crews at sea, AMSEA has a Quincy, Mass., based staff of 50 to support the at-sea operations, maintenance and overhaul planning and activation demands. This dedicated small force conducts all support activities including, but not limited to, crew hiring, planning crew rotations and travel, ship provisioning, engineering support, procurement activities and shipping, operational arrangements including tugs in foreign ports and working with the military planners.

Bishop hopes the performance of AMSEA's ships and employees during the operation convinces the government to build and charter more prepositioning ships.

"I'm trying to present and make people understand the lessons learned from operation Desert Shield," Bishop said. "When they analyze the data, one can see that we can only meet a fast closure requirement of 5-10-15 days to support a need by prepositioning. Prepositioning at sea is the answer. In addition to the Marines, there also are indications that the U.S. Army may be interested in at-sea prepositioning. They realize that the fastest sealift ships can only provide support about a month after an identified crisis starts."

"Besides," Bishop added, "our world is undergoing significant change. Forgetting the present crisis, most people agree that a U.S. presence will be required in the Middle East for the next 25 years. The solution must be unobtrusive to the host nation and therefore will probably not involve a large military unit on 'holy soil.' Therefore, the acceptable solution must be prepositioning."

■ Myron Holtzman



# Weidenbaum predicts basic changes in U.S. defense industry's structure

When Murray Weidenbaum talks, the defense industry should listen.

Weidenbaum, President Reagan's first chairman of the Council of Economic Advisers, learned the nuts and bolts of defense procurement as senior operations analyst in engineering at Fort Worth Division during 1957-58 and later as corporate economist for The Boeing Co.

"You'll see fundamental changes in the structure of the (defense) industry," said Weidenbaum, now Mallinckrodt Distinguished University Professor at Washington University in St. Louis and director of the university's Center for the Study of American Business. Weidenbaum has just completed a book on the problems resulting from the adjustment to the defense build-down, "Beyond The Cold War."

"The publisher and I are waiting for the resolution of the Gulf crisis," said Weidenbaum. "Unfortunately, the Gulf situation has confused the public's view of where the defense industry is headed."

"The big run-up in fuel costs and operating expenses (for Operation Desert Shield) isn't going to do the industry any good. And I think we're into a recession that's going to last well into 1991. Any recession is bad for the budget, and this one is going to put the federal deficit into the neighborhood of about \$300 billion. And that's a pretty rough neighborhood."

Despite the continuing squeeze on the defense budget, Weidenbaum sees the need for strong national security. "Of course, I welcome the change in our relationship with the Soviet Union," he said. "But they are still the only other military superpower in the world. And to date, the changes in their strategic arsenal have been modest. We need to remain strong, and we must be overwhelmingly strong in relation to the military power of any third-world nation."

The Department of Defense and the industry need to make many painful decisions in the next few years, according to Weidenbaum. "There remains much to be done, particularly in the restructuring of our tactical forces and equipment," he said. "The emphasis on technology in the industry is still central, but in some areas like electronics the military sector has fallen behind the commercial one."

Weidenbaum sees the increasingly bureaucratic nature of the defense acquisition process as the culprit. He has been advocating basic reforms for years, but remains skeptical that Congress will enact them.

Despite these problems and the shrinking defense industrial base, Weidenbaum said that "even a stripped-down version of the defense industry contains the greatest concentration of scientific and technological talent in the country, likely in the world. Sure, the industry is coming off an all-time peak, and defense companies can't expect to maintain their peak size. They'll have to become leaner and more competitive."

The winners among the aerospace/defense firms will be those "who are quick to react to the changing national security requirements," Weidenbaum said. "It's still a large market. A company with the diversified mix of General Dynamics is in a good position if it makes the right decisions and makes them at the right time."

The current financial woes of the industry are worrisome to Weidenbaum. "This situation has been some years in the making," he said. "It's time for DoD and Congress to eliminate the changes (in the acquisition process) they made in the 1980s. Those changes squeezed the contractors too much. Even during the buildup in the 1980s, you

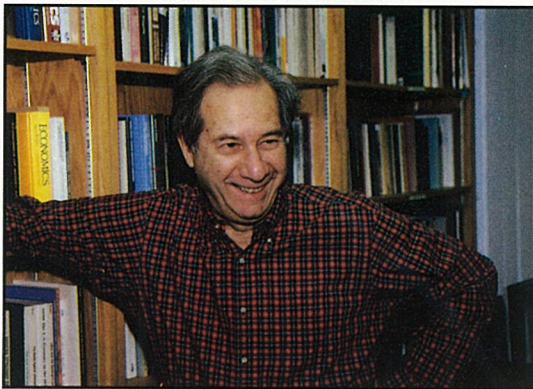
saw an erosion of the defense industrial base. That should have been a tip-off."

He acknowledges that Congress and the news media have some responsibility for creating a hostile environment for the industry. "I don't think every employee in the defense industry is a model of integrity," he said. "But the overall level of integrity in the industry is the same as in the private sector, government and academe. But programs that work just aren't news. The industry just has to roll with that punch."

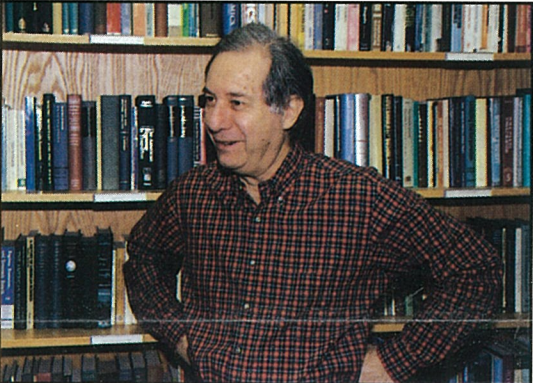
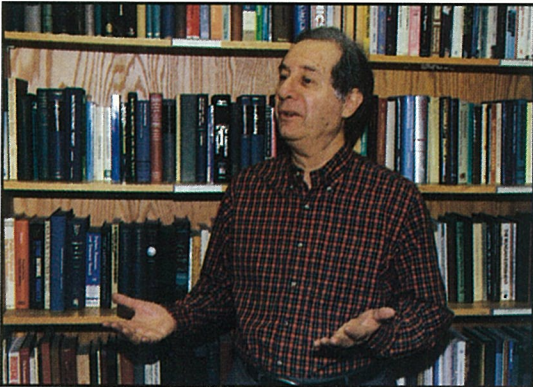
Weidenbaum hopes that if war does come in the Gulf, it will be a "short, intensive and successful effort. Once it's over, we could see the start of an economic upturn."

But he suggests that recovery from the current recession may be hard and slow. "This time it's not just the usual cyclical forces pushing the economy down," he said. "This is a blue-collar and white-collar recession. Defense is a good example."

■ George Salamon



PHOTOS BY TOM RULE



Murray Weidenbaum

## Contract awarded for future vehicles

The Army has awarded a \$286 million contract to Armored Vehicle Technologies Associated, a joint venture of Land Systems Division and FMC Corp.

The cost-plus-incentive-fee contract calls for the team to design, build and test a prototype common chassis as part of the Army's Armored Systems Modernization program.

The program is the Army's plan to use one common chassis for four different 21st century armored vehicles: the Block III tank, the Advanced Field Artillery System, the Future Infantry Fighting Vehicle and the Combat Mobility Vehicle. The contract includes development of detailed designs for all four vehicles, as well as for an automatic loader and a system integration demonstrator.

Fifty percent of the work will be done at Land Systems in Sterling Heights, Mich., and 13 percent at FMC in San Jose, Calif. The remainder will be performed by subcontractors throughout the United States, including

Cummins Engine Co., General Motors Allison Transmission Division, General Motors Hughes Aircraft Co. and Western Design Co.

A similar contract was awarded to Teledyne Continental Motors. One company will be selected in 1994 to build a full-system prototype.

"We're excited to be finalists in this competition and we're confident our design will provide the Army with the best possible solution for a common chassis," said Michael Bolon, general manager of the Land Systems-FMC team. "The combined research and development talents of companies on our team will ensure that the U.S. Army continues to have a winning edge on the battlefield well into the 21st century."

Land Systems manufactures the M1A1 Abrams main battle tank. FMC produces the Bradley Infantry Fighting Vehicle.

### Savings and stock investment plans

Annual rate of return for the 12-month period ending:

	Nov. 1988	Nov. 1989	Nov. 1990
<b>Salaried</b>			
Government bonds	7.1%	9.9%	8.7%
Diversified portfolio	21.7%	33.5%	(6.0)%
Fixed income	10.9%	10.3%	10.1%
<b>Hourly</b>			
Government bonds	7.3%	10.1%	8.7%
Diversified portfolio	22.0%	34.4%	(6.0)%
Fixed income	10.7%	10.4%	10.1%
<b>GD stock closing price</b>	\$50.50	\$43.62	\$23.37
( ) Denotes negative number			

## Business group lauds GD communicators

The General Dynamics divisions in San Diego dominated the 1990 awards competition sponsored by the San Diego Chapter of the International Association of Business Communicators.

San Diego employees received seven first-place and four runners-up certificates. Awards of Excellence went to:

- Nancy Durham-Mumford and Suzanne Parlett, Convair art and editorial, 1989 annual report to employees;
- Space Systems' marketing communications and graphic services for the Explorer brochure and the division's 1990 calendar;
- Parlett and Pat Gayton, General Dynamics San Diego 1990 WalkAmerica campaign;
- John Laven, Convair art and editorial, for illustration, Earth Day brochure;
- Mike Munson, Tim Whitehouse and Mike Ozaki, Convair still photo, for a timecard poster series;
- Julie Andrews, public affairs, for writing, total quality management case studies, *General Dynamics World*.

Awards of Merit went to:

- Cynthia Watkins, Convair research and engineering, for the 1990 U.S. Savings Bond Campaign;
- Ed Passi and Linda Loffredo, Space Systems, for 1989 annual report to employees;
- Ozaki and Durham-Mumford, Convair art and editorial, for Earth Day brochure;
- Space Systems marketing communications and graphic services for Advanced Launch System lithograph.

Earlier in the year, *General Dynamics World* received an Award of Merit in the tabloid category from the St. Louis chapter.

## Convair's new cleaner cuts ozone depletion

The first of four vapor degreasers at Convair Division's Lindbergh Field Plant in San Diego has been replaced with an environmentally friendly process.

The chlorofluorocarbon-charged vapor degreaser had been used to clean parts for manufacturing. Its elimination means emission of fewer gasses that deplete the ozone layer, which screens out harmful ultraviolet radiation from the sun.

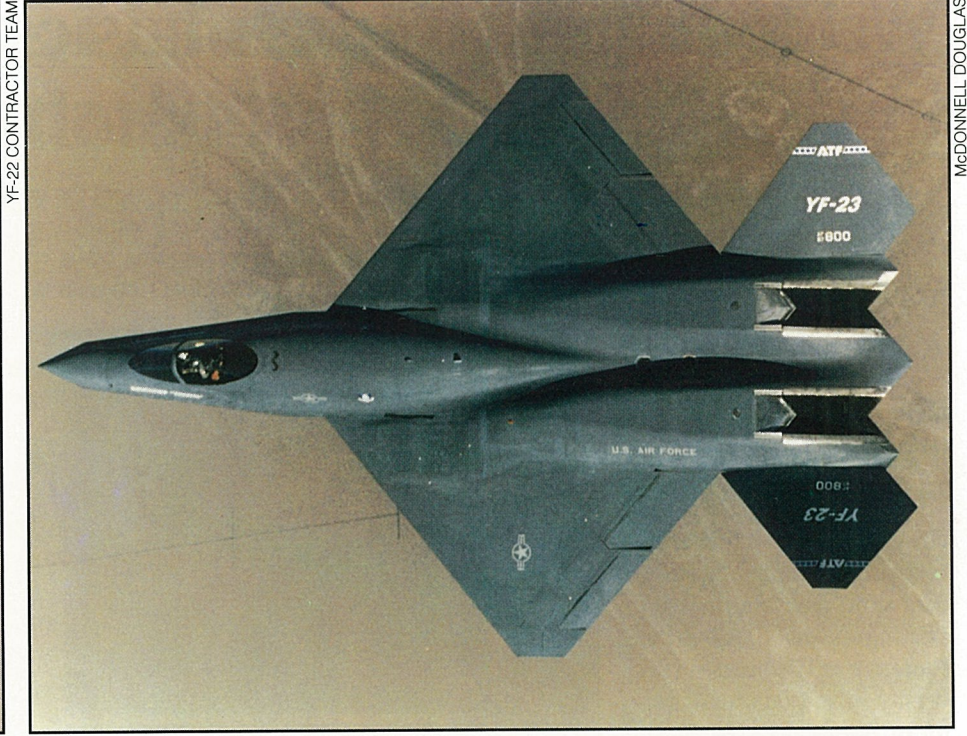
"The company is embarking on a program to eliminate degreasers totally," said Gerry Hardacre, Convair's environmental resource manager. "We have three more degreasers that use chlorofluorocarbons, and we are studying alternate cleaning methods for No. 2."

"Removing the first vapor degreaser represents a major step forward for Convair and our employees in the area of environmental responsibility. We can and will make a difference in keeping San Diego a better place to live for our families."

An alkaline solution cleaning process replaces the decommissioned degreaser. But the No. 2 degreaser presents a greater challenge. This degreaser cleans intricate, curved tubes. The process action team that red-tagged the first degreaser will have to thoroughly prove that an alternate method can do the job.

■ Julie Andrews





The contenders for the Advanced Tactical Fighter are the Lockheed-General Dynamics-Boeing YF-22 (left) and the Northrop-McDonnell Douglas YF-23.

## Winning hand to be shown in May Air Force calls ATF contenders' final bets

The Lockheed-General Dynamics-Boeing Advanced Tactical Fighter team has prepared a final proposal for full-scale development of the program.

Proposals from the two competing contractor teams — Northrop and McDonnell Douglas are the other bidding combination — were due to the Air Force Jan. 2. The winning team that will build the Air Force's next-generation fighter is scheduled to be named in early May.

The two Lockheed-General Dynamics-Boeing YF-22 prototypes have completed successful test flights at Edwards Air Force Base, Calif. They met or exceeded all performance expectations. "We've had a spectacular series of accomplishments," said Sherman Mullin, president of Lockheed Advanced Development Co.

The two YF-22s rapidly expanded their performance in speed, maneuverability and angle-of-attack testing, logging accomplishments that usually occur only after months or even years of flight tests, according to Mullin. The first prototype made its initial flight Sept. 29.

The test program included launches of an AIM-120 Advanced Medium Range Air-to-Air Missile and an AIM-9 Sidewinder heat-seeking missile, although neither was required. The prototypes were flown supersonically with and without afterburner. They extensively demonstrated thrust-vectoring, which uses propulsion to aid maneuverability.

"The performance of the airplane is phenomenal," said Dave Ferguson, Lockheed's chief test pilot.

Ferguson said the YF-22 is easy to fly and very responsive. "You just think about what you want to do, and the next thing you know you're doing it," he said.

The YF-22's performance is strikingly superior to that of an F-15, the aircraft the Advanced Tactical Fighter will replace, Ferguson said. "It's magnitudes above any other airplane I've ever flown," he said.

Fort Worth Division test pilot Jon Beesley was among the other pilots who flew the YF-22.

The YF-22's structural design endows it with low

observability characteristics in league with Lockheed's F-117 stealth fighter, along with better maneuverability than any fighter in service, Mullin said.

Advanced composites make up about 23 percent of the prototypes' structure. The production F-22 will be 40 percent composites by weight.

The YF-22's advanced technology resulted in no significant problems during the test program — which is "not typical" for a new fighter, according to Mullin. He cited the Fort Worth-developed digital, quad-redundant fly-by-wire flight control system, which performed from the beginning with no major glitches despite its complexity.

The Air Force plans for the winning team to build 11 full-scale development aircraft, the first to fly in 1995. The first production plane would be delivered in 1997.

■ Joe Stout

## Air Defense, bomber crews develop B-52 defensive weapon

For the past 18 months, Air Defense Systems Division has been working with the Air Force to develop an air-to-air missile as a defensive weapon for B-52 Stratofortresses.

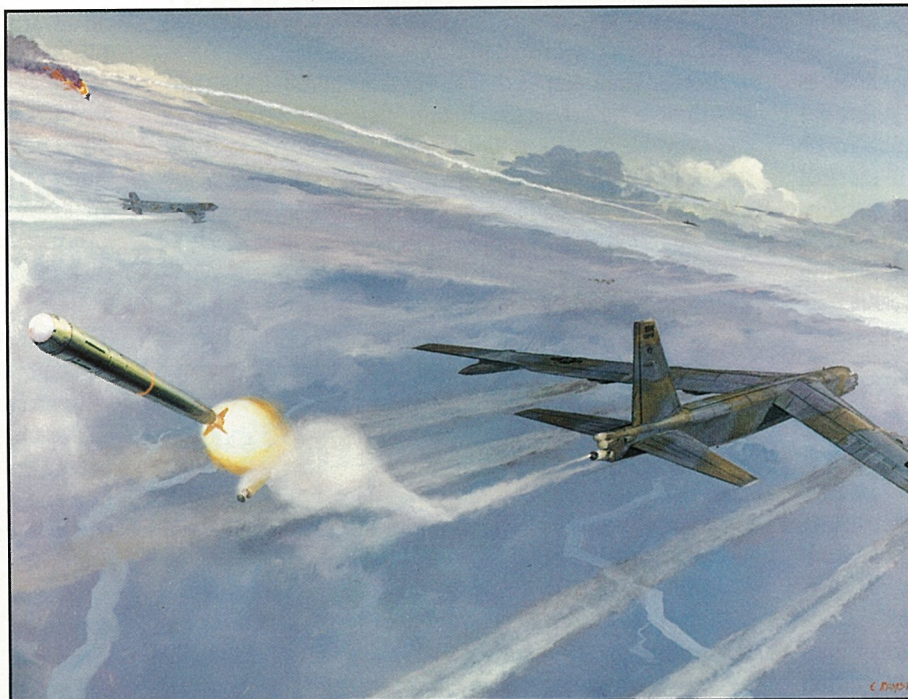
Called Scorpion, the weapon is based on technology for Air Defense Systems' Stinger shoulder-fired anti-aircraft missile. Scorpion is a competitor to replace the B-52's tail gun.

Members of the 7th Heavy Bombardment Wing at Carswell Air Force Base, Texas, teamed with Air Defense Systems engineers to design the Scorpion's launcher system. Engineers from a cross-section of Air Defense Systems disciplines traveled from the division's Rancho Cucamonga, Calif., facility to Carswell and worked side-by-side with crews and maintenance and base support personnel.

The division team included Joe Richardson, manager-Scorpion missile program; Carole Hurzeler and John Smith, systems engineering; Chuck Radney, total quality management task force; and George Schumacher, marketing. A team from Cincinnati Electronics, which specializes in the B-52's fire control system, was on hand.

Division and Air Force personnel worked together to solicit participation from wing members who would be involved in everyday operations, maintenance and support of Scorpion.

"By listening to the customers and using their ideas, needs and rationale, we were able to develop a superior product at a fraction of the cost," Richardson said. "That's



A drawing shows a B-52 launching a Scorpion anti-aircraft missile.

total quality management in action.

"If we had stayed in Rancho Cucamonga to design this system, it would have taken six more months and we would not have been sure of our assumptions until it was installed.

"By going to Carswell Air Force Base, our people really know what the problems are, what takes a lot of time, and what needs and does not need attention," Richardson continued. "The engineers on the team really know how hot and cramped a flight line is. We have a

sense of sitting at the gunner's console and knowing what the aircraft crew's options (in combat) are.

"But, most importantly, this is a system designed by the Air Force men and women who use it. The combined Air Defense Systems Division/Cincinnati Electronics teams were merely the instrument that the Air Force people used to get their ideas formulated."

Strategic Air Command requested the study at Carswell. The effort received enthusiastic support from the wing commander down throughout the chain of command.

The Air Defense Systems team gave a series of briefings to the wing's staff, pilots, navigators, electronic warfare officers, gunners, gun handlers, loaders, technicians, ammunition handlers, quality personnel and other base support agencies. After each briefing, the team interviewed the attendees and went with them to their work areas.

In addition, the team observed day and night flight line maintenance operations to better understand the problems encountered at these times.

Results of the preliminary design and integration study were given to Strategic Air Command headquarters and Pentagon Air Force action officers. The next step in the program will be to fire a Scorpion from an aircraft.

■ Jerry Littman



GENERAL DYNAMICS

# World

Volume 21 Number 2

February 1991

## GD products stir up Desert Storm

Convair Division's Tomahawk cruise missile, Fort Worth's F-111 and F-16 aircraft, and a host of other General Dynamics products are spearheading the United Nations coalition to liberate Kuwait in Operation Desert Storm.

Tomahawks sounded the first clap of thunder in Desert Storm when they led the Allied air attack that opened the

### Security stressed ... page 2

operation Jan. 17. "The Tomahawks are the first shots in the opening round of the war," said Capt. David Bill III, commander of the battleship USS *Wisconsin*, which launched some of the Tomahawks. The firings marked the first time cruise missiles had been used in a war.

The performances of the General Dynamics-designed cruise missile and aircraft drew reams of praise from the military and the media, including:

- More than 90 percent of the first 100 Tomahawks fired hit their targets, according to press reports.
- "I'm extremely pleased with the effectiveness of the cruise missiles," said Gen. Colin Powell, chairman of the Joint Chiefs of Staff.
- "F-111 fighter-bombers have played a key role in the air attacks against targets in Iraq and Kuwait," *The New York Times* said.
- The F-16 was second in use only to the A-10 ground-attack plane during the first night's attack, according to media reports. About 175 Fighting Falcons are par-

(Continued on page 5)

A Tomahawk is fired from a ship during testing.



FILE PHOTO

## 1990 loss is biggest in company history

General Dynamics' 1990 and fourth-quarter 1990 losses are the largest in its history.

The company reported on Feb. 6 a loss of \$577.9 million for 1990 and a fourth-quarter loss of \$530.1 million. Results for the quarter include special charges against earnings of \$858.9 million before tax or \$566.9 million after tax. For the year, these charges totaled \$1.33 billion before tax or \$881.1 million after tax.

"Our results for 1990, which are impacted by substantial special charges, reflect the unprecedented market uncertainties of our industry," said Chairman and Chief Executive Officer Bill Anders. "These uncertainties will test our ability as an organization to adapt effectively to the new realities of our business."

The special charges were for the A-12 aircraft, Atlas launch vehicle, Single Channel Ground and Airborne Radio System and restructuring:

- The government terminated the A-12 on Jan. 7. The company increased its reserves against investments in the program by \$274 million in the fourth quarter.
- Fewer than planned launches in 1990-91 and an increase in estimated cost for Atlas resulted in a fourth-quarter loss of \$300 million.
- The company recognized a \$70 million fourth-quarter charge against the radio system for anticipated losses in the second and third production options.
- General Dynamics also took a one-time fourth-quarter charge of \$214.9 million for restructuring related to the changing industry environment.

## News Briefs

### Portugal becomes 17th nation to order F-16s

Portugal will purchase 20 F-16A/B Fighting Falcons. All will be built at Fort Worth Division. Deliveries will start in late 1993.

The purchase agreement was signed in Portugal Dec. 27. The U.S. Congress was notified of Portugal's intentions in June 1990.

Portugal is the 17th nation to order F-16 Fighting Falcons. F-16s are in the inventories of the U.S. Air Force and Navy and the air forces of Belgium, Denmark, the Netherlands, Norway, Israel, Egypt, Pakistan, Venezuela, South Korea, Turkey, Greece, Thailand, Singapore, Indonesia and Bahrain.

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### Tomahawk share is 40 percent

Convair Division recently received 40 percent of the government's fiscal year 1991 requirement for Tomahawk cruise missiles. The remainder went to McDonnell Douglas.

For the third consecutive year, Convair's award includes the 10 percent set aside by the government for the dual-source contractor with the highest quality.

Convair will build 160 Tomahawks for \$188.5 million. McDonnell Douglas will produce 240 missiles for \$253.9 million.

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### Hall takes on new tasks

Asaph H. "Ace" Hall has been named corporate vice president-information systems and administrative services.

His new title reflects expanded assignments. Hall had been corporate vice president and general manager of Data Systems Division. He will continue to oversee Data Systems while adding responsibilities for corporate flight, travel, facilities and services.



## Convair Recreation Association honored as best in the nation

The Convair Recreation Association has been named the 1990 top employee services and recreation program in the nation by the National Employee Services and Recreation Association.

"We were impressed by General Dynamics' commitment to provide a wide variety of programs and facilities for the well-being of its employees," said Patrick Stinson, executive director of the national association. Stinson's group was established in 1941 and represents more than 15 million American workers.

"This award is a real tribute to the thousands of General Dynamics employees who have volunteered their time and talents over the years to build and maintain our recreation association," said Brian Stevens, Convair Recreation Association administrator.

"We presently serve over 16,000 employees here in San Diego with a tremendously varied program of fitness programs, club activities and employee services," Stevens said. "Membership is free and available to all company employees and their families as well as retirees."

Convair Recreation Association, located in a 27-acre complex at the Kearny Mesa Plant, was built largely by employee volunteers. The facilities include a 19,000-square-foot clubhouse, a park with picnic areas, facilities for tennis, softball, soccer and volleyball, a carousel and a miniature railroad. The Health Fitness Center has three locations. The Convair Recreation Association Emporium provides discounted goods and services for employees.

The association also offers catering for employee gatherings and company picnics, a travel office and an 89-acre park in the Cuyamaca Mountains for camping and hiking.

## Freeman rescuers win state contest

Freeman United Coal Mining Co.'s Orient Mine rescue team recently finished first out of 24 teams in the annual Illinois Mine Rescue Contest.

Teams work simulated mine rescue problems, which may take up to two hours to complete. Team members are also tested on their knowledge of mine ventilation, mine gases, roof control and overall rescue and recovery procedures.

The winning team is based at Freeman's Orient Mine No. 6 near Waltonville in southern Illinois. The Orient team also finished third in the West Kentucky Contest in 1990.

Coal companies throughout the United States maintain over 150 mine rescue teams to protect the lives of miners as well as mine property. Teams compete in a number of local, state and national mine rescue competitions to practice skills necessary for safe rescue and recovery operations.

Freeman United, a General Dynamics subsidiary, maintains two fully equipped mine rescue teams to respond to a mine disaster anywhere in the Midwest.

A national contest, normally with over a hundred teams competing, is held every other year in Louisville, Ky. Freeman United teams have finished in the top 20 during the last two national events. ■ Francine Williams

### GENERAL DYNAMICS World

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Pierre Laclede Center, St. Louis, Mo. 63105

Manager of Internal Communications: Dave Lange

Contributors: Julie Andrews, Dan Barrett, Pete Connolly, Graham Gavert, Donald Gilleland, Myron Holtzman, Dean Humphrey, Jerry Littman, George Livesay, Bruce McIntosh, Pat Moritz, Karl Oskoian, Jack Price, Tom Rule, Chris Schildz, Eric Solander, Peter Stamos, Joe Stout, Joe Thornton.

## Company steps up its security; workers should take precautions

Security offices throughout the corporation are taking measures to protect company employees and property against Iraqi sympathizers who have threatened worldwide terrorist attacks against United Nations coalition countries.

"Since the United States has gone to war in the Persian Gulf, U.S. intelligence agencies expect that (Iraqi President) Saddam Hussein will attempt to make good on his threats," said Bill Ferrier, corporate director-security. Most acts are expected to occur outside the United States, Ferrier said.

Security throughout the world has tightened since the start of Operation Desert Storm. From airports to utilities to communications facilities, heavy security has been ordered.

"Our General Dynamics locations overseas have been alerted and have implemented previous security precautions," Ferrier said. "The possibility of an attack on one of General Dynamics' U.S. facilities cannot be excluded."

Incidents expected from Iraqi sympathizers could be bombings, assassinations, random shootings, aircraft hijackings, demonstrations and riots, security officials said. Radical Arab students, some of whom are in the United States, and Arabs whose visas have expired but cannot be located, are prime suspects.

General Dynamics' security measures have included setting up communications links with other division security departments, local police departments and the local FBI, according to William M. Hurd, corpo-

rate security manager in Washington.

Notifications to employees at the divisions and overseas have reminded employees to review the company's procedures and policies on security.

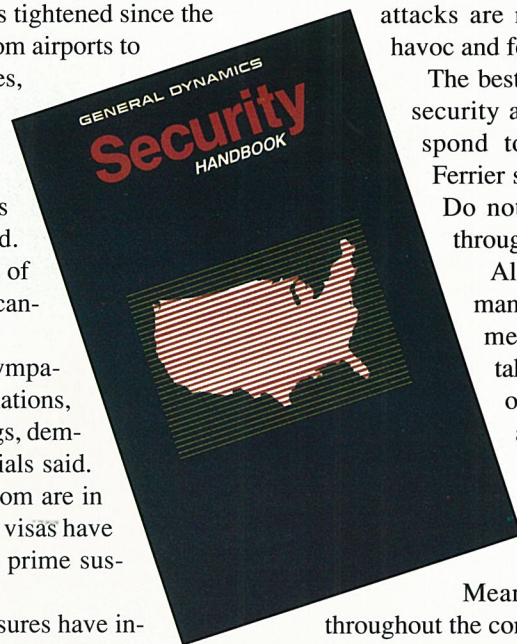
Some symbolic targets, such as the Statue of Liberty or Washington Monument, could be hit. Other targets would include banks, electric power facilities, oil utilities, federal government buildings, communications facilities, water resources, transportation networks and defense contractors, according to the government. Terrorist attacks are meant to create vulnerability, havoc and fear, FBI officials said.

The best course of action is to increase security alertness so employees can respond to any unusual circumstance, Ferrier said. One action for employees: Do not allow unbadged "tailgaters" through security entrances, he said.

Alan Langston, corporate security manager, listed other precautionary measures that employees should take. "Employees should be aware of packages and other items that are out of place; they should avoid demonstrations; and those traveling should stay abreast of all advisories," Langston said.

Meanwhile, security departments throughout the company will continue to increase their awareness, according to Ferrier. "It's been a team effort," he said. "We have prepared for this type of situation with extensive planning." ■ Myron Holtzman

### Employees can boost security by becoming thoroughly familiar with the General Dynamics Security Handbook.



## First M1A2 prototype tank goes to Army

Land Systems Division recently delivered the first of 10 prototype M1A2 Abrams main battle tanks to the Army for initial testing.

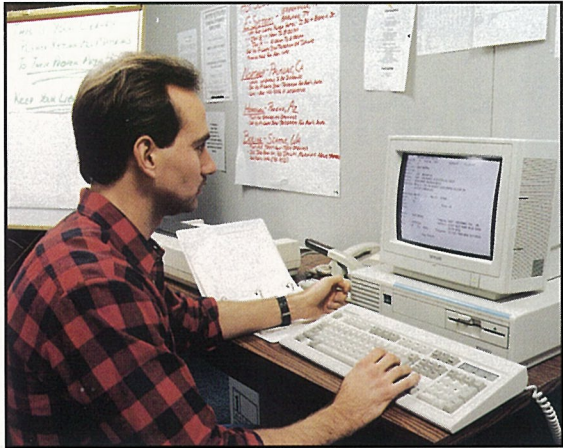
The M1A2 prototype will undergo production testing by Land Systems and then by independent government test agencies. Contractor and government testing will be conducted on the M1A2 prototypes throughout 1991 and 1992.

The M1A2 is the next generation of the M1 series of main battle tanks. It is the second major upgrade and the fourth production model in the series. The first production M1A2 tank is scheduled for delivery in November 1992.

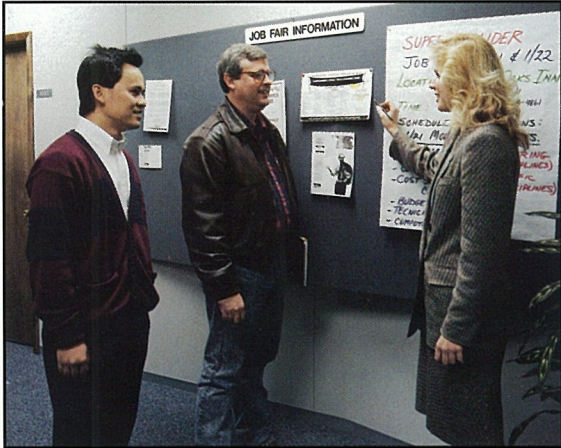
"The M1A2 provides dramatic improvements in the tank system's fighting ability, survivability and supportability," said R. Gary Diaz, Land Systems director-engineering programs. "Working under the leadership of the Army, we have developed and implemented a system that will give our soldiers a winning edge on the battlefield."

The U.S. Army and Saudi Arabia have ordered M1A2 tanks. Britain is considering the M1A2 to replace its aging fleet of Chieftain tanks. General Dynamics is also discussing possible Abrams sales with representatives from Sweden, Pakistan, the United Arab Emirates and Canada.

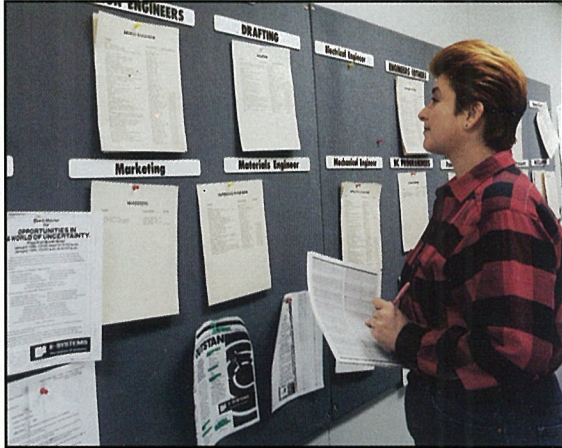




David Smat, who was laid off because of the A-12 cancellation, reviews opportunities listed in a job bank data base at Fort Worth's Career Transition Center.



Brenda Bjork of Fort Worth's Career Transition Center staff explains the center's resources to Cory Vuong (left) and Keith Stripling, employees affected by recent layoffs.



Roberta Sanchez checks job openings posted in a resource room at Fort Worth's Career Transition Center. She is one of thousands of individuals affected by recent layoffs.

PHOTOS BY TOM HARVEY

# Coordinated aid goes to those laid off at Fort Worth

Community groups, service organizations, government leaders and the company are working cooperatively to provide many kinds of assistance to employees laid off at Fort Worth Division.

The division and its surrounding communities were dealt a heavy blow in January when the Department of Defense unexpectedly canceled the A-12 program, immediately eliminating 3,500 jobs. Those layoffs came in the midst of an ongoing reduction in force, a process that began several months ago in response to declining F-16 orders and a smaller business base.

The ultimate impact of these job losses on the area's economy remains unknown. The most severe effect, however, is on the lives and families of people who are laid off.

o o o

## COMMUNITY SUPPORT

Many elements of the community are providing resources to help meet the unprecedented demand for human services created by the layoffs. Shortly after the A-12 cancellation, Fort Worth's Chamber of Commerce organized a meeting of business and community leaders to plan a coordinated response.

The effort that grew out of the initial meeting created many special provisions to help those laid off. For example, local utility companies are allowing affected families to defer their bill payments or make installment payments for essential services. Several businesses, including a pharmacy chain, are offering special discounts for affected families. An area community college extended spring registration and offered financial aid for individuals who want to learn new skills, and another announced expanded vocational training programs.

The area United Way and its member agencies also responded. In mid-January, the United Way sponsored a community meeting to make laid-off workers aware of the help that it can offer.

United Way efforts include a referral hotline that can direct callers to many kinds of aid. The organization is also making copies of its "Coping With Unemployment" brochure available to all laid-off employees.

Bruce Schlosberg, director of the Jewish Social Service Agency and president of a council representing 54 United Way-affiliated agencies, said all the groups are willing to help in any way. "When we first heard about the crisis, we reacted immediately," Schlosberg said.

Meanwhile, the Tarrant County Medical Society publicly reminded displaced workers that many doctors are willing to accept reduced or delayed payments in times of hardship. "Most doctors are quite willing to work with patients," said Medical Society President Richard Penny.

## GOVERNMENT ASSISTANCE

Government leaders were also quick to recognize the problems facing laid-off employees and the entire North Texas region. Rep. Pete Geren was one of the first to react, with a request for aid from a special Pentagon fund established to help defense workers hurt by military cuts. If approved, this will mark the first use of the fund.

Sen. Lloyd Bentsen urged the Labor Department to grant Texas \$10 million in federal retraining money for the laid-off workers. Texas Gov. Ann Richards requested a federal emergency aid grant of \$6.9 million for retraining programs.

The Texas Department of Commerce provided \$2 million under the Job Training Partnership Act for a program administered by Fort Worth's "Working Connection" agency at its Career Assistance Center.

The Texas Employment Commission provided emergency coordination and a special location for mass unemployment registration immediately after the A-12 was canceled.

## COMPANY'S ROLE

Fort Worth opened a Career Transition Center in June to assist employees receiving 60 days' notice that their jobs would be eliminated. "The goal of the career transition program is to provide early intervention for employees as soon as possible after they are notified, to keep them focused on the future and actively seeking new jobs," said Jerre Yoder, Fort Worth's director-employment.

The center offers job search workshops, career counseling, resume preparation, clerical assistance, a resource library, job referral and use of telephones, among other services. The job search workshops are conducted by Drake Beam Morin, an outplacement consulting firm. Retraining opportunities for those who qualify under the Job Training Partnership Act are provided through the city's Working Connection retraining center.

The Career Transition Center was initially used both by salaried and union-represented employees. "As of January, a second facility, the Career Assistance Center,

opened with programs specifically designed to meet the needs of hourly employees," Yoder said.

The Career Assistance Center was established through a cooperative effort of the company, its unions, the Working Connection and the Texas Department of Commerce.

"The Career Assistance Center offers a two-track program that allows employees to either seek new jobs in their present fields or explore retraining opportunities with government assistance," Yoder said. "The center offers workshops and services similar to those at the Career Transition Center and opportunities for retraining under provisions of the Job Training Partnership Act."

The services of the two centers are available to all employees affected by the A-12 cancellation. More than 2,400 employees and former employees used the Career Transition Center during a single week in January, Yoder said.

The career transition program includes counseling to help affected employees deal with emotions they experience when they first receive layoff notices. Fort Worth's Employee Assistance Program is also supporting many of the affected employees and their family members through referral to counselors.

"The overall response to this situation underlines the fact that we are all concerned about the people who have been affected by layoffs," Yoder said. "The various things that are being done are a direct result of this concern. The company is appreciative that so many elements of the community have joined in the effort to help these individuals."

■ Joe Stout



TOM RULE

**Pace honored.** Chairman and Chief Executive Officer William A. Anders presents his predecessor, Stanley C. Pace, with the plaque describing the Distinguished Lecture Series on Leadership in Ethics that has been established in Pace's name by the Ethics Resources Center and the company. The presentation took place at a retirement dinner for Pace. The endowed series of annual lectures, slated to begin this fall, will feature lectures by distinguished public or academic figures on the practical application of moral leadership in business, government and other institutions. Pace, who was honored by the establishment of the endowed lecture series for his guidance in ethics at General Dynamics, said, "I can't think of an alternative the company could have done that would have pleased me as much."





DAN NASH

Roger Jett pulls our legs, and Tim Whitehouse's tie, while Mike Munson puffs on a cigar amid a series of award-winning posters executed by Munson and Whitehouse.

## Cameras and comedy put serious subjects in focus

Steve Martin may be known as the original wild and crazy guy, but he has nothing on Tim Whitehouse and Mike Munson, both photographers at General Dynamics' San Diego facilities.

That's the shared opinion of Roger Jett, recently retired supervisor-still photography, and Mike Ozaki, supervisor-graphic design department. "They're absolutely crazy," Jett says. "They work well together as photographic comedians. Give them an idea and just stand back and watch their imaginations take over."

That's exactly what happened in some award-winning posters that use humor to make serious points. It started when Jett and Ozaki assigned the dubious duo to produce a poster that would enhance the finance department's campaign to keep time cards up to date. When Ozaki and writer Nancy Mumford decided that humor was the best avenue for the campaign, they knew Whitehouse and Munson were right for the job.

"I've seen them turn out some pretty funny pictures," Ozaki says. "After we sold the idea to finance, we knew Mike and Tim were perfect for the project."

The final concept was finally hatched after a brief brainstorming session. But it took Munson and Whitehouse a few more days to conceive the perfect photo for the situation.

"It's what a lot of creative people do," Whitehouse says. "We talk about it, but can't think of a good idea. A day or two later, though, we started getting these silly ideas, too silly really. Some of the ideas have us falling out of our chairs from laughing so hard."

"But we kept bouncing ideas off each other, played a little mental basketball that tickled each other's funny bone, and three or four good elements came out of it."

Adds Munson: "If anyone ever saw us, they would have thought we were crazy. Just a facial expression would set us off laughing. We have a lot of fun setting up for the pictures, but the photos aren't really funny until

they're seen in the final product."

The original time-card photo depicted the two — they captured themselves through time exposure — as the Frankenstein monster and a mad scientist grabbing a card and getting a shock for not keeping their time cards "current."

"All the posters are like that," Jett said. "They use good, clean humor to get the message across."

*"Previous posters  
didn't seem to work, so  
we decided to try  
another route — humor. ...  
I'm just glad the company  
gave us the power to do it."*

— Mike Ozaki

The lighthearted poster concept was so successful that the idea was expanded to include three more time-card posters, including one that used Stone Age, Iron Age and computer age themes.

"To tell the truth, everyone kind of resisted the humor idea from the outset," Ozaki said. "It was out of the ordinary. But previous posters didn't seem to work, so we decided to try another route — humor. However, we had to lean on each other to support the idea. I'm just glad the

company gave us the power to do it."

The concept also captured a Bronze Quill Award of Excellence in the San Diego chapter's International Association of Business Communicators photography competition.

In addition, division fire officials approached Jett and his photographers to generate safety awareness posters. Two were finished — one in time for the Christmas holidays with Santa Claus (Munson) holding overloaded electric extension cords — and two more are being completed, including a good housekeeping poster for Space Systems Division.

After thinking the piece through, most of the poster photography is turned out in several hours. The major time is spent setting up the shot. The Christmas artwork, for instance, took only five minutes to photograph but several hours to prepare.

All of the posters have been produced in black and white, except for the Christmas shot. The Christmas photo is a color print on poster-sized shiny paper. The technique provided a crisper image and a 3-D effect that provided a greater impact, Jett says.

"Although humorous posters are what people seem to want," Whitehouse says, "Mike and I always have to find the fine line between silliness and getting the point across."

So far, their sense of humor has captured the proper essence of the message. In fact, some of the posters have been distributed corporatewide. Seven divisions have expressed interest, including some that want posters made for their specific needs.

"That tickles us pink," Whitehouse says. "Mike and I had entertained thoughts of corporatewide exposure to the posters. Now it's becoming a reality."

■ Myron Holtzman



## Portuguese purchase will be first to benefit

# Paper chasers slash red tape in contract process

Fort Worth Division's new order for Portuguese F-16s (see page one) may shake out as a first — the first foreign military sales program to use a streamlined contract definitization process right from the start.

Contract definitization is the lengthy procedure that defines details of new procurement programs. It typically takes more than three years and includes hundreds of hours of meetings involving General Dynamics, the Air Force, foreign customers, subcontractors and numerous other parties.

Various steps of the process are key to finalizing the contract: establishing an aircraft configuration for pricing, developing a fixed price proposal, reviewing and auditing the proposal, negotiating the final price, and bringing all the paperwork together to form the definitized contract.

The process has been considered cumbersome and much too lengthy for many years.

A team of General Dynamics and Air Force representatives was established in February 1990 to devise an improved definitization approach for F-16 foreign military sales.

Contract definitization for foreign sales has required an average of 1,260 days. Aircraft deliveries sometimes begin before the contract is fully defined. As a result, payments have been delayed and cash flow has been adversely affected.

"The team set a goal of cutting the process in half, to 630 days," said Fort Worth's Dick Steves, director of F-16 business acquisition and chairman of the team. After months of work and numerous meetings in Fort Worth and at the Air Force Aeronautical Systems Division, Wright-Patterson Air Force Base, Ohio, the team designed a new system that is expected to cut the total process to about 550 days.

The team had to first understand the many subprocesses within the system and chart the process flow — monumental tasks within themselves. The team divided the overall definitization process into six subprocesses. Thirty-four potential delay points — stages where time is often wasted — were identified.

"Most of us on the team have control over a certain part of the process," Steves said. "The team's original makeup was half General Dynamics and half Air Force. We felt we were empowered to make changes."

Parts of the improved system have already been implemented for ongoing programs. For example, in a relatively new program in which follow-on F-16s have been ordered by Pakistan, it took less than 100 days to finalize the long-lead contract after the purchase agreement was signed. The previous average was more than 300 days.

Some of the improvements result from changing the sequence in which steps occur, according to Del Fussell, another team member. An example concerns definition of the aircraft configuration, which involves customer selection of "bells and whistles" and the necessary U.S. government approvals.

"In the past, you couldn't get the proposal activity started until a lot of decisions were made about the configuration, and this can happen very slowly," Fussell

said. "The team developed an approach that uses a most-likely configuration, arrived at by group consensus, for proposal pricing purposes. You can get on with the process by handling optional items with separate proposals as the decisions are made."

In addition to the major changes, the team suggested many smaller actions, such as document format revisions, which are designed to improve communication throughout the process, Fussell said.

The team briefed the process to several Air Force orga-

nizations that will be responsible for ensuring the success of its implementation.

The team's progress has been possible because of General Dynamics and Air Force commitment to total quality management and customer orientation, Steves said.

"In addition to designing this system, the team members have solved many everyday problems because of the trust and communication that we've established," he said.

■ Joe Stout



Fort Worth's Karen Trombley works with process flowcharts she makes using templates and a personal computer.

## Sharp secretary snaps logistics logjam

Karen Trombley, an executive secretary in Fort Worth Division's business acquisition department, recognized a problem with using large flowcharts to plot the contract definitization process for F-16 foreign military sales.

Critical process teams sometimes cover entire walls with charts illustrating complex procedures and business arrangements. This was not feasible for the contract definitization team because it alternated meetings between Fort Worth and Wright-Patterson Air Force Base in Dayton, Ohio. The team needed flowcharts but faced

a logistical problem.

Trombley developed an automated system for creating and updating easily portable charts using a personal computer, templates and existing software. Sections of the long diagrams, some of which plot four-year processes, can be printed individually and assembled to produce complete charts.

Trombley took 16 hours to set up the program, which has since been adopted by several other total quality management teams at Fort Worth.

■ Joe Stout

## Desert Storm

(Continued from page 1)

ticipating in Desert Storm, reports said.

- "Tomahawk cruise missiles have been used with apparently devastating effect against Iraqi ground defense systems," said Peter Jennings of ABC News.
- Four F-111s blew up two Kuwaiti oil complexes to halt Iraq's dumping of petroleum into the Persian Gulf.
- "They're doing beautifully; very, very well," Lt. Gen. Tom Kelly, director of operations of the Joint Chiefs of Staff, said of the Tomahawks.
- "Manned airplanes flew 1,000 sorties with unbelievably light casualties," said Robert Holsapple, a spokesman at the Joint Cruise Missile Project office, after the first night's action. "One reason for that was that the Tomahawks went in first and knocked out defense systems such as radar."



Air Force personnel prepare an F-16 from Shaw Air Force Base, S.C., for a mission. Shaw F-16s are reportedly participating in Operation Desert Storm.

- "It (the Tomahawk) costs a lot of money, but when you look at the precious savings of lives, I think the dollars are well-invested," said Sen. Sam Nunn.
- Naval vessels, including the Electric Boat-built attack submarine USS *Louisville*, have launched hundreds of

Tomahawks at targets in Iraq and Kuwait. One Tomahawk reportedly hit the presidential palace in Baghdad.

F-111 fighter-bombers and F-16 Fighting Falcons also figure prominently in air missions against Iraq.

The F-111 can carry almost any kind of Air Force bomb, including laser-guided ordnance that is highly accurate. F-111s are flying numerous bombing missions in the air war. A total of 83 F-111s are participating, according to media reports.

F-16s are carrying out a variety of air superiority and ground attack missions. The 174th Tactical Fighter Wing, the only unit flying close air support F-16s, is doing "magnificently" in Desert Storm, according to reports.

Other General Dynamics products are also in use. Allied forces in Desert Storm employ Land Systems M1 Abrams and M60 tanks; Air Defense Systems' Phalanx close-in ship defense gun, Sparrow air-to-air missile, Standard ship-to-air missile and Stinger shoulder-fired anti-aircraft weapon; and American Overseas Marine Corp.'s maritime prepositioning ships.



## General Dynamics flashback



The Dragonfly outperformed faster, more expensive aircraft in bombing and strafing enemy troops in Vietnam.

## Cessna's 'Tweety Bird' evolved into feared war bird

Air Force pilots who earned their wings in it in the late 1950s dubbed it "Tweety Bird." Ten years later, some of these same pilots found it to be a fearsome war bird.

The Jekyll-and-Hyde aircraft is Cessna's A-37 Dragonfly, a plane born out of Cessna's T-37 jet trainer developed in the 1950s. The Dragonfly earned accolades for accuracy and survivability supporting ground forces in Vietnam.

The Dragonfly putted along at speeds no faster than 478 mph. Although not as sleek or as fast as its supersonic counterparts, the Dragonfly carried 1 1/2 times as much ordnance as the F-100 Supersabre, for example, at about a tenth of the cost per plane.

A-37 airmen prided themselves on their bombing accuracy. "If we miss a target by 20 meters, we're disappointed," 1st Lt. Charlie Carter, an A-37 flier, said during the Vietnam War. Analysis of missions flown by the first A-37s during a 120-day evaluation in Vietnam showed that about half the bombs they dropped landed within 45 feet of targets.

Further analysis demonstrated that the A-37 could stand up to ground fire. In the 5,000 sorties flown during the evaluation in 1967, A-37s suffered only 13 hits, none serious enough to bring down an aircraft or lose a pilot.

These wartime performances could have hardly been envisioned by Cessna engineers when they responded to the Air Force's call for a new basic jet trainer in 1952. The aircraft, designated the Cessna 318, won the contract over 14 other designs submitted by seven companies. The first aircraft, the XT-37, first flew in October 1954. Demand was so great that Cessna set initial production at one T-37 every 11 hours and 12 minutes. That rate slowed to four per month, then rose to eight a month during the Vietnam War.

Instructor and flight cadet sat side-by-side in the T-37. Its two relatively low-thrust engines, together with its benign training mission, probably prompted its nickname of "Tweety Bird."

"Tweety Bird" grew claws in the early 1960s when the Air Force investigated counter-insurgency aircraft to fight "brushfire wars" such as the one in Vietnam. Cessna modified existing T-37 airframes with higher-thrust engines, wingtip tanks to increase fuel capacity, six wing pylons to carry ordnance, and a 7.62mm minigun in the nose. These two-seat planes, redesignated YAT-37Ds, partici-

pated in a counter-insurgency flyoff against the North American/Columbus YAT-28D in 1964.

The Air Force shelved the project before selecting a winner. But about a year later, the growing intensity of the Vietnamese conflict caused the Air Force to order 39 counter-insurgency T-37s. These aircraft were modified similarly to those in the flyoff with the exception of two additional wing pylons. Now called A-37A Dragonflies, 25 of the planes participated in the 120-day evaluation.

Their successful debut led to their incorporation into the 604th Special Operations Squadron at Bien Hoa Air Base. They flew 10,000 sorties in 1968 and took only about one-fifth the small arms hits as other aircraft.

The A-37's small size – 28 feet 3 1/4 inches long with a wingspan of 35 feet 10 1/2 inches – and high maneuverability made it a tough target. Its tight turning radius enabled it to keep the target in sight after a first bomb run and return for a second pass if needed. It required only about six hours of maintenance for every flight hour. And at about \$340,000 per copy, the Dragonfly was a bargain.

Meanwhile, Cessna developed the A-37B, a completely new plane rather than a modification of existing T-37 airframes. The A-37B incorporated two General Electric J85-GE-17A engines that doubled the takeoff power of the T-37. These bigger engines allowed the A-37B to carry more than 5,000 pounds of bombs and rockets on its eight wing pylons. Cessna also improved the fire control system, added an in-flight refueling probe and strengthened the airframe. Cessna delivered the first production A-37B in May 1968.

Dragonflies served with U.S. and South Vietnamese air forces during the war. During the early 1970s, reserve squadrons began receiving A-37s, including aircraft direct from the production line. This marked the first time that Air Force Reserve and Air Guard units, accustomed to operating hand-me-down planes, received new combat aircraft.

Cessna made 577 A-37Bs before halting production in June 1977. Dragonflies – some of them still operational – found homes with air forces in Chile, Colombia, Ecuador, El Salvador, Guatemala, Honduras, South Korea, Peru, Thailand and Uruguay. As of 1987, captured A-37s were one of few U.S. aircraft types being flown by Vietnam. ■ Dave Lange

## Abilene machinist produces music that climbs to No. 1

Carlos Fernandez, a machinist at Fort Worth Division's Abilene, Texas, facility, is gaining renown as one of the country's hottest Tejano songwriters.

Tejano is to music what Tex-Mex is to cuisine: It reflects the flavor of the American Southwest along with traditional Hispanic qualities.

The 10-year General Dynamics employee has been writing and playing music since he was 15 years old. His band, Los Fantasticos, performs within a 200-mile radius of Abilene. His teen-age son Daniel is the drummer.

Fernandez took the band to San Antonio for a recording session about five years ago. That's when his songwriting talent was quickly recognized. Recording artists from all over the country began to inquire about his work.

Several of the songs have already been hits. One, "Tu y Yo" (You and I), recorded by Ramiro "Ram" Herrera, reached No. 1 on Tejano charts.

Fernandez has mixed feelings about being in the spotlight. "All this attention is not for me," he said. "It's good to be recognized for doing good work ... I've been lucky that people like my songs."

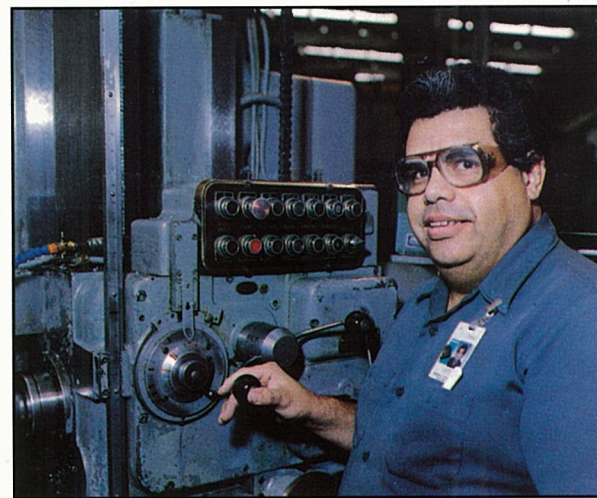
Fernandez said he writes mainly for fun. He likes to accentuate the positive in his musical work. "I look around at life," he said. "Love is the most beautiful thing ... caring for people ... these are the things I write my songs about." He puts this philosophy into practice by performing several charity concerts with his band each year.

His music and his General Dynamics job as a detail mill operator balance each other, he said. "When I'm here (at the Abilene Facility), I forget about music," he said. "When I'm with my band, I forget about work."

"General Dynamics has been my bread and butter, and songwriting has just given me a chance to compete with full-time songwriters. It is an honor to have other people hearing my music." ■ Steve Abel



Abilene machinist Carlos Fernandez warms up on the accordion (top), one of the principal instruments heard in Tejano music, and operates equipment at Abilene Facility.



STEVE ABEL

STEVE ABEL





Air Defense Systems' Freda Reifer meets with Capt. Ruth VanDyke, the first female officer to participate in the division's Training With Industry program.

## Army officer learns ins and outs of industry

Army Capt. Ruth VanDyke is learning the ways of the defense contracting world – from the contractors' point of view.

VanDyke is participating in the Training With Industry program at Air Defense Systems Division-Pomona. She is working side-by-side with engineers, contracting officers, marketing representatives and others in production and quality control for 11 months.

"This program really helps us to understand how the defense contracting business works," VanDyke said. "When I return to a regular Army assignment, I will be in the contracting field, supervising others who work with industry. I can see how my experience here will help me to educate our people to do a better job."

VanDyke temporarily left a 10-year career as a chemical warfare officer to participate in the program, which is designed for Army officers to learn about private industry. Most officers in the program are captains or majors with 8-13 years' service and come from specialties dealing with Army equipment and procurement.

Pomona has played host to a Training With Industry officer every year since 1984. VanDyke is the first female officer in the Pomona program.

VanDyke's duties include a variety of staff and operating assignments, according to Freda Reifer, training coordinator at Pomona. VanDyke's schedule is worked out by Reifer, VanDyke and the departments involved. The requirements of industry and the professional needs of the Army and the individual must be mutually satisfied, Reifer said.

"Capt. VanDyke will have an opportunity to contribute to our industry, improve herself professionally, and learn some new techniques she can take with her when she goes on to other Army assignments," Reifer said.

The officers learn high-level managerial techniques and the relationships of the specific industry to related Army functions. The officers become capable of performing special Army program activities and serving as a source for industrial management innovations.

"The government has told those of us enrolled in the Training With Industry program to learn the best methods for getting quality weapons, parts and services at a fair price, without putting the contractors out of business," VanDyke said. "That means learning and working together."

■ Eric Solander

## New company to market pollution controls

General Dynamics has broadened its operations in Mystic, Conn., to include products and services to reduce toxic chemical usage and emissions.

Called Environmental Sciences and Technologies, the newly formed company combines the technical expertise of Fort Worth Division's environmental resources management team with the services philosophy of General Dynamics Services Co.

Fort Worth's environmental team is made up of scientists and engineers who develop, test and implement materials and processes with improved environmental, health and safety characteristics. This establishes reduction of toxic materials as a priority from the initial design of products through delivery.

General Dynamics Services Co. was established in 1978 to transfer new products and services to customers of the corporation.

Zero discharge of hazardous wastes is the long-term goal of General Dynamics. Companywide hazardous waste emissions have been reduced by 43.7 million pounds, or 78 percent, in the last five years.

Environmental Sciences and Technologies is marketing professional science and engineering services and products that have been developed in pursuit of the zero emissions goal. Examples include:

- Services to develop and implement programs for economical compliance with the 1990 Clean Air Act. This includes evaluating and eliminating air emission sources in a technically and economically sound manner while satisfying long-term regulatory requirements.
- A low-vapor-pressure, general-purpose cleaning solvent, containing no ozone-depleting chemicals, that can be substituted for chlorofluorocarbon 113 and methyl chloroform in many applications. When combined with a specific waste management system, the solvent greatly reduces polluting emissions. A patent for the product is pending.
- A water-based degreasing technology that includes regeneration of solutions using a proprietary ultrafiltration process.

## Idea for Sunday 'drive': visiting Catalina Island

Catalina Island is a 30-mile plane or boat ride from the Los Angeles waterfront. However, Mike Dykes, a facilities engineering specialist at the Air Defense Systems Division's Rancho Cucamonga Facility, "drove" there on a recent Sunday.

Dykes, using a one-passenger, 300-pound personal watercraft, joined 49 other adventurers, each in similar watercraft, for the trek from Dana Point to Catalina.

The watercraft is made for lakes and rivers, not the open and stormy Pacific Ocean, Dykes said. The 7-foot-long fiberglass watercraft contains a 500 cc, two-cycle engine. Handlebars and a finger throttle control the vehicle.

All of the "drivers" wore wet suits and life jackets for protection.

"It was a real challenge," Dykes said. The perils he and his companions faced included rough seas, strong winds, limited visibility, injuries and physical exhaustion.

And it was also a lonely voyage: Besides the chase boat that accompanied the "drivers," they saw only one ship and a few flying fish. Luckily, they didn't encounter any sharks.

The 50-member group left Dana Point about 9 a.m. and arrived on Catalina about three hours later. They stayed on the island for several hours to relax, fill up their 6 1/2-gallon fuel tanks and eat lunch.

The trip back to Dana Point took almost four hours; the top speed was 35 mph.

Dykes explained that personal watercraft don't have any navigational aids, so the 50 "drivers" followed the chase boat hired for the occasion. The chase boat stopped every 15 minutes to make sure that all participants, who were spread over a quarter of a mile, were accounted for.

"We had to keep our eyes glued to the chase boat," Dykes said. "We couldn't see anything except the chase boat because it was so overcast."

Dykes' wife, Marilyn, who works in the division's publications department, and their two adult children are avid jet skiers and spend their recreational time at either a private facility in Baja California, Mexico, or at Lake Havasu, Ariz.

■ Jerry Littman

## Fort Worth lends expertise

Meeting customer requirements is one of the basic principles of total quality management.

Fort Worth Division employees put the concept into practice recently by conducting total quality management training sessions for Defense Plant Representative Office personnel. The training helped Air Force Plant 4's personnel meet their need to start a total quality system.

Employees on "Q+" teams from Fort Worth's engineering department and Data Systems Division-Central Center's product software group designed a training series for the Defense Plant Representative Office.

Defense Plant representatives worked with Fort Worth to tailor the curriculum. With permission, employees extracted material from total quality management training Fort Worth purchases from consultants.

A series of six weekly 30-minute sessions resulted covering fundamental total quality management topics.

"The cooperation between contractor and DPRO personnel in making this effort happen is encouraging," said Col. Robert Riggs, Plant 4's Defense Plant Representative Office commander. "It's TQM at its best."

### Savings and stock investment plans

	Annual rate of return for the 12-month period ending:		
	Dec. 1988	Dec. 1989	Dec. 1990
<b>Salaried</b>			
Government bonds	7.1%	9.7%	9.5%
Diversified portfolio	15.2%	32.4%	(4.5)%
Fixed income	10.7%	10.3%	10.0%
<b>Hourly</b>			
Government bonds	7.3%	9.9%	9.4%
Diversified portfolio	15.5%	33.3%	(4.5)%
Fixed income	10.6%	10.3%	10.0%
<b>GD stock closing price</b>	\$50.75	\$44.87	\$25.25
( ) Denotes negative number			





Test pilots put YF-22 prototypes through their paces, including aerial refueling (left), during a recently concluded flight test program. The YF-22 poses with the F-117 stealth fighter (right).

# Pilot praises YF-22's agility after intense flight tests

**“Possibly the most agile aircraft ever built.”**

That's how General Dynamics test pilot Jon Beesley describes the YF-22, the Lockheed-General Dynamics-Boeing candidate for the Air Force's Advanced Tactical Fighter. The aircraft is competing against the Northrop-McDonnell Douglas YF-23. The Air Force is to announce the winner this spring.

Two YF-22 prototypes successfully demonstrated thrust-vectoring capabilities during a test program that ended in December. The plane's engine nozzles can be pointed up or down to direct exhaust and improve maneuverability.

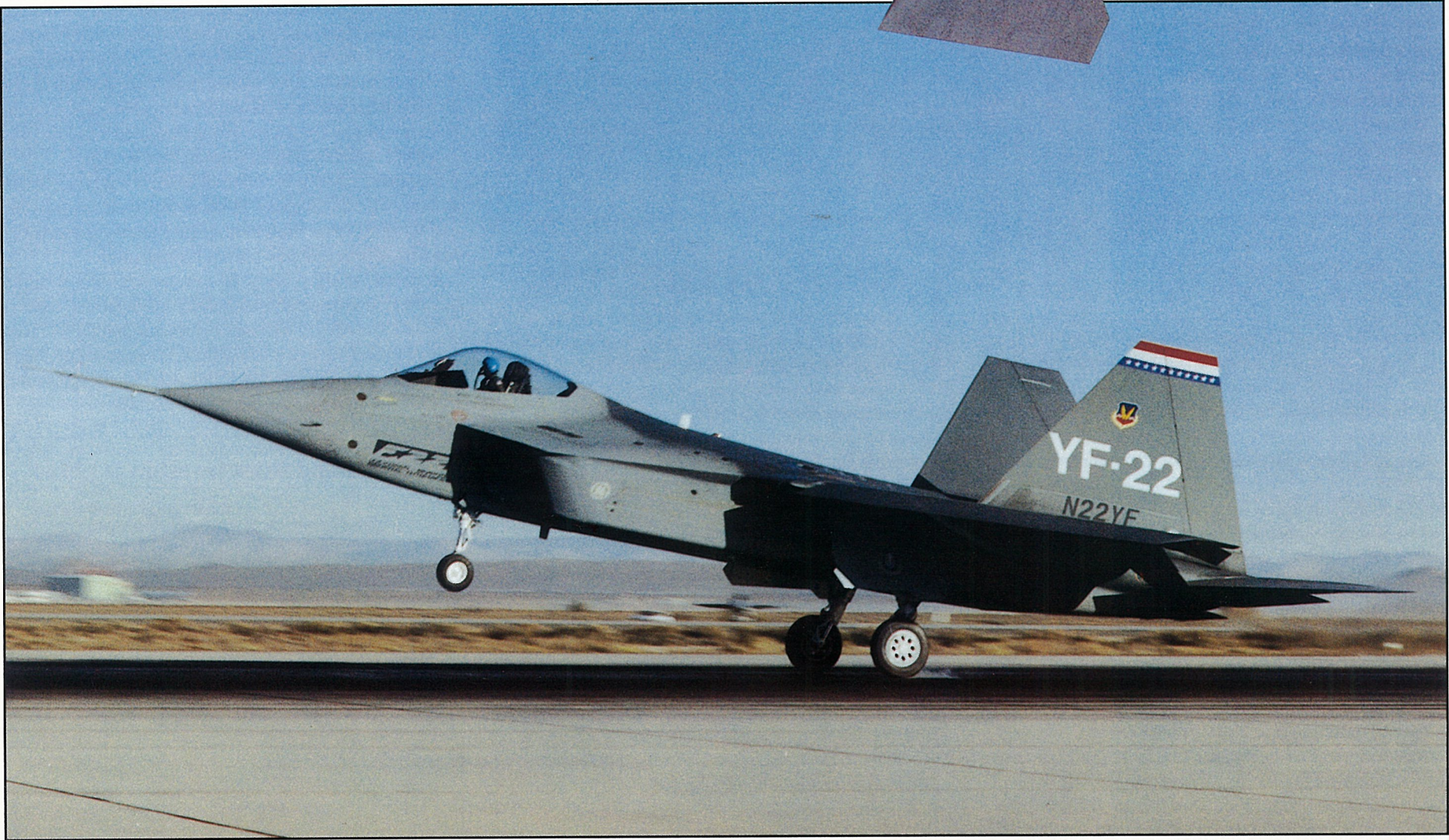
No other aircraft has demonstrated the YF-22's precise controllability while flying at extreme angles of attack, Beesley added.

The YF-22s flew 74 times for a total of 91.6 hours during the test program, which began in late September. "This may be recorded as the most aggressive flight test program in history," Beesley said. "It lasted 90 days but was the fruit of four years of hard work."

The aircraft flew at supersonic speeds without afterburner and accelerated to more than twice the speed of sound with afterburner. The prototypes successfully fired two kinds of air-to-air missiles, the AIM-9 Sidewinder and the Advanced Medium Range Air-to-Air Missile, from internal weapons bays.



PHOTOS BY YF-22 CONTRACTOR TEAM





# GD World

Published for employees of General Dynamics Corporation

Volume 21 Number 3 April 1991

## Strategic changes planned for company

**"The U.S. defense industry's toughest challenge during the next few years will be simply to survive. Companies will be struggling to recover from the one-two punch of debilitating fixed-price development contracts awarded in the 1980s and a steadily declining weapons acquisition budget."**

—*Aviation Week & Space Technology*,  
March 18, 1991

**T**he defense industry has undergone vast and far-reaching changes in the last few years. The Cold War has ended, taking with it a major stimulus for the defense industry. This has combined with continuing federal deficits to reduce defense appropriations. In addition, onerous contractual and regulatory terms and conditions and industry overcapacity have trimmed profit margins and reduced cash flows for defense firms.

"These are the new realities of the defense industry," Chairman and Chief Executive Officer Bill Anders said. "These events are probably not just a cyclical downturn. They are most likely here to stay, although their impact will be softened somewhat as the government moves away from fixed-price-type development contracts, which will reduce risk and improve the progress payment rate."

"We remain strongly committed for the long term to our role as a premier defense contractor, and to our mission of providing the highest-quality, most-effective products and services for our customers. But to be strong and successful, General Dynamics must adjust its way of doing business to operate in the new realities of our environment."

Dealing with these new realities requires a new company strategy. Because our revenues from defense—which comprise about 85 percent of earnings—will most likely drop to permanently lower levels, it is clear that we can no longer do business as usual. In the long run, failure to adjust to reduced revenues will hurt



Chairman and Chief Executive Officer Bill Anders discusses company strategy with almost 150 key management members at a recent three-day meeting in St. Louis.

General Dynamics, our employees and our ability to provide our customer with superior products and services.

Our strategy will ensure that General Dynamics survives in the new industry environment by generating the cash needed for us to control our destiny as a strong, stable and competitive business. "A strong cash position will give General Dynamics the required flexibility to capitalize on opportunities—in our marketplace or elsewhere—that offer acceptable rates of return," Anders said.

The recent reduction in defense spending, along with adverse terms and conditions, has caused the price of a share of General Dynamics stock to fall by as much as 70 percent from its 1986 high. The stock's low price does not reflect the underlying strength of the company as a major source of our country's security. The outstanding performance and reliability of our products during Operation Desert Storm demonstrated that strength.

Improving share value is important to shareholders, employees and customers. Many employees own company stock, either through the Savings and Stock Investment Plans, as part of their compensation, or through private transactions, and increasing share value will raise the net worth of these employees.

Improving share value strengthens the company and stabilizes employment for the remaining employees. Higher value will encourage present and prospective shareholders to invest in the company, thus providing a source of capital for General Dynamics to grow for the benefit of employees and customers as well as shareholders.

Our customers benefit from our increased shareholder value and financial stability. We believe that our major customer, the Department of Defense, shares our view that financially strong contractors are critical to meeting weapons system performance and quality requirements and preserving a strong U.S. defense industrial base.

There are eight key elements to realizing our goal to increase shareholder value.

- We are launching operational programs that are targeted at tighter cost controls, reduced inventory, lessened risk and improved productivity. These efforts are aimed at increasing our financial strength by improving the profitability of our \$23 billion backlog. We believe we can do this while enhancing quality.

- As defense budgets continue to shrink, the industry will be forced to decrease in size. General Dynamics must

### INSIDE GDWorld:

#### From "hold" to "buy" 2

Three influential Wall Street analysts call GD stock a good buy.

#### SSIP enrollment 2

SSIP changes prompt employees to become shareholders.

#### Tomahawk 4

Behind the success story lie decades of frustration and hard work.

#### Cessna 8

Caravan's reliability helps Federal Express win Malcolm Baldrige Award.

anticipate these necessary reductions rather than react after the fact. Slow response directly threatens the employment security of the bulk of our employees.

- Profitability standards are being increased on new contracts to ensure an acceptable rate of return.

- While seeking improved margins on new contracts, we will continue our commitment to deliver quality to our customers at the lowest cost. We will vigorously compete for new defense business that meets our financial criteria.

- Though we are committed to be a long-term defense supplier, other business opportunities are being examined that can improve our financial position. In addition, we will strive to raise the percentage of our earnings from commercial operations. Cessna Aircraft Co., Material Service Corp., Commercial Launch Services' Atlas space boosters and Convair Division's work on MD-11 fuselages generate almost all of our current commercial revenues and earnings. These areas are anticipated to grow, and we will also seek investments in new defense work. We will explore acquisitions and divestitures.

- We will work to maintain a strong balance sheet that builds cash reserves and financial strength to provide the flexibility to pursue opportunities. General Dynamics will bring the benefits of its increasing financial strength to new business such as the Advanced Tactical Fighter. We are committed to the pursuit of this program and new business reflecting the improved business conditions fostered by current Department of Defense management.

- We will pursue upgrades to and service agreements for our "franchise" products that we have designed, produced and sold with great success. For example, 17 nations have ordered F-16 Fighting Falcons and over 2,800 have been built, establishing an ongoing market for upgrades, modifications of existing airframes,

(continued on page 3)



# 'Buy GD,' advise three influential analysts

**G**eneral Dynamics' new corporate strategy being implemented by Chairman and Chief Executive Officer Bill Anders and the company's new management team has prompted three influential Wall Street analysts to recommend the company's stock as a good investment.

Their recommendations were good news for shareholders and employees alike. General Dynamics' stock, which declined 43 percent in 1990 and 6 percent earlier this year, regained seven points as of April 10 following the analysts' reports.

The analysts, Judith Comeau of Goldman, Sachs, Phil Friedman of Morgan Stanley and Jack Modzelewski of Paine Webber, upgraded their ratings of General Dynamics stock from "hold" to "buy."

Noted Comeau: "Anders... believes the defense industry is in an extended decline and his motto is 'The guy with the best balance sheet wins.' Mr. Anders

has taken three dramatic actions. First, he revised the management compensation plan to tie (it)... to increases in General Dynamics' stock price. Second, he slashed capital spending from \$320 million to \$120 million. Third, he recognizes charges to downsize employment and facilities."

Added Friedman: "The management transition taking place at GD has the potential to be one of the most dramatic shifts we have seen in this industry in the past decade. The new chairman, Bill Anders... is starting to send Wall Street news of a new era at the company. Management recognizes that the defense budget is likely to continue to decline over the next few years, and that GD's program base could well decline at a greater pace than that of the overall budget. Rather than fight an uphill battle and continue to invest funds on low-return high-risk ventures, we believe management will focus on... generating cash."

Modzelewski cited Anders as the catalyst for change at the company. "Anders' charge is to 1) increase profitability, 2) expand GD's options (basically by increasing cash), but the major emphasis will be to 3) run GD as a business," he said.

"Profits are no longer a bi-product of making high-tech weapons, but the primary emphasis," Modzelewski added.

Buying the company's stock is a fairly safe bet, Comeau concluded. "The valuation on General Dynamics' shares is so low that we see minimal downside risk," she said.

"We're grateful that Wall Street is beginning to appreciate GD's new strategy, which will make us a strong business for the benefit of employees and customers as well as shareholders," said Jim Cunnane, senior vice president and chief financial officer.



Judith Comeau

TOM RULE

## Employees take stock in GD

The number of salaried and non-union hourly employees electing to buy company stock in the Savings and Stock Investment Plans nearly tripled during the enrollment period that ended March 15. That period was the first time the company offered an all-stock option.

**M**ore than 15,000 employees—38.3 percent of the total participating in the plans—are investing in company stock. Nearly 12,000 have chosen option eight, the all-stock option.

Option eight is the only option that matches contributions dollar-for-dollar. General Dynamics gives 50 cents in company stock for every employee dollar in the other seven options, which offer combinations of stock, government bonds, fixed income or diversified portfolio.

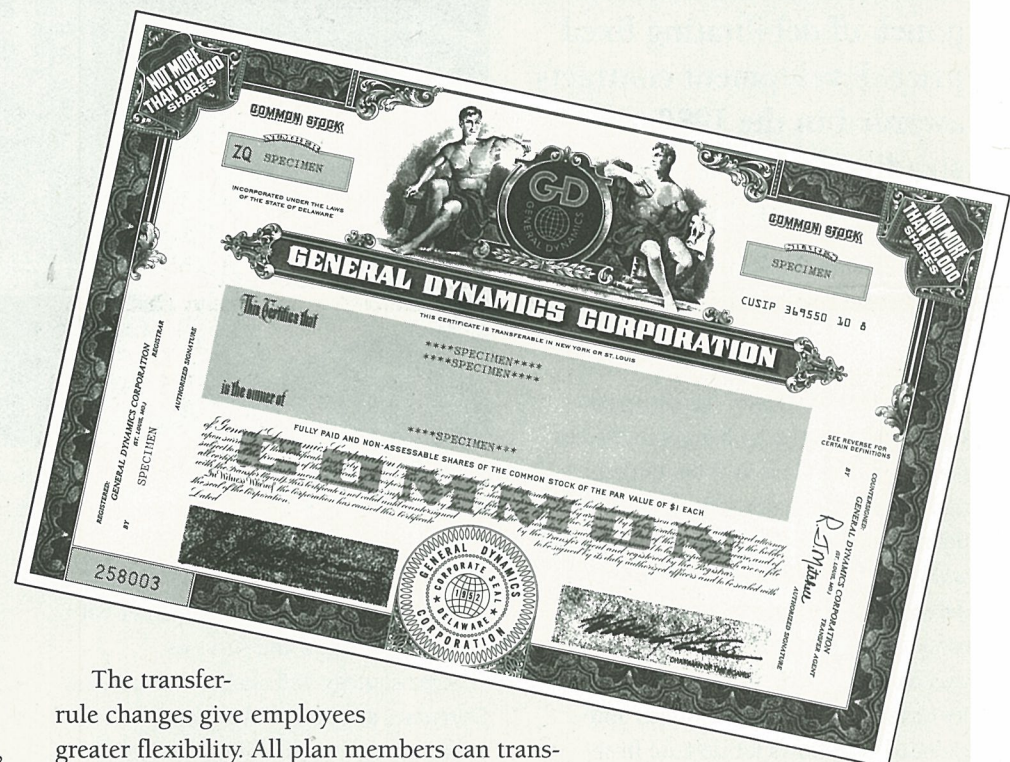
"We're very pleased that so many of our employees have chosen to become shareholders in the company," said Roger Groh, corporate director-employee benefits. "They have given themselves a greater stake in General Dynamics' success, and their stock purchases help strengthen the company as well. In addition, those in option eight will greatly increase the value of their investment because of the dollar-for-dollar match."

It's not too late for those who missed the March 15 cutoff to enroll in option eight or any of the other options through the Direct Information Access Line (DIAL). New enrollments or changes in options for existing accounts are accepted 30 days or more before the beginning of each fiscal quarter. The next enrollment period, for the quarter beginning July 1, ends May 31.

Option eight is one of four fundamental changes to the Savings and Stock Investment Plans. These modifications have also been offered to local union leadership to allow members in union Savings and Stock Investment Plans a chance to invest in the company's future.

The other major modifications to the plans:

- General Dynamics' matching contributions for all investment options are in company stock.
- The company's matching contributions for options 1-7 in the salaried plan fell from 75 cents to 50 cents. Matches to the non-union hourly plan remained 50 cents.
- Improved investment fund transfer rules offer greater flexibility in the management of account balances.



The transfer-rule changes give employees greater flexibility. All plan members can transfer investments annually from one fund to another.

All company stock must be held for five years before being transferred, withdrawn or borrowed. However, no stock may be transferred before 1993. Loans will be taken from a member's account beginning with non-company stock fund investments.

"Until now, transfers could only be made from one fund to another once between ages 50-54, once between ages 55-59, then annually after age 59," Groh said. "Investments in the stock fund could not be transferred until an employee retired. However, since this is recognized as a retirement income supplement, we felt employees should have the opportunity to balance their investments after a reasonable period."

Assets from the fixed-income fund, however, may not be transferred because contracts with insurance companies restrict transfers to "competing investment vehicles."

Higher rates are obtained by computing the fund for longer terms.

A brochure mailed to all salaried and non-union hourly employees details the Savings and Stock Investment Plans and answers many questions about the changes in the program. DIAL representatives are available to answer employees' questions.

SSIP	ANNUAL RATE OF RETURN FOR THE 12-MONTH PERIOD ENDING:		
	Feb. 1989	Feb. 1990	Feb. 1991
<b>SALARIED</b>			
Government bonds .....	6.2%	8.8%	10.6%
Diversified portfolio .....	13.2%	18.9%	13.9%
Fixed income .....	10.6%	10.3%	10.0%
<b>HOURLY</b>			
Government bonds .....	6.3%	9.0%	10.5%
Diversified portfolio .....	13.3%	19.3%	14.0%
Fixed income .....	10.5%	10.3%	9.9%
<b>GD stock closing price</b>	<b>\$50.75</b>	<b>\$37.25</b>	<b>\$25.00</b>



## The new arithmetic

A few years back, when educators took a more direct approach with words and numbers, a student's basic inventory generally comprised a McGuffey Reader, a Palmer penmanship primer and a slate. Actually, this was quite a few years back—about the same time that John Holland was trying to stay afloat underwater, the Wright brothers were trying to get airborne, and all of them were trying to return in one piece.

The McGuffey Reader fostered the fundamentals of language, the Palmer primer imparted good handwriting and the slate (this was even before the dreaded “flash cards”) was used for arithmetic or “sums.” The slate was actually a turn-of-the-century hand calculator, the only difference being that the student did the thinking. The teacher would walk the aisles, examining each one's slate and pointing out mistakes.

That's about where we find ourselves today as a company. The “sums” for our business environment don't add up like they used to. Defense budgets are going down with no end in sight. Contractors such as ourselves are caught with excess employees and capacity, unsatisfactory contract terms and conditions, and too little cash. So Bill Anders and his team must start fresh. First they'll tackle the near-term problems while planning to deal with the challenges—and opportunities—farther down the road.

The quality of the company's products that made them winners in the Persian Gulf conflict is one part of the slate that will stay with us. Our customers can depend on that. The superiority of our core defense business and the reliable support our customers have come to expect will remain.

But the external and internal environmental changes that are threatening our company and our industry cannot be ignored. The 40-year-old stimulus to our marketplace that was represented by the Soviet threat is diminishing dramatically. A shrinking defense budget and intensified competition have combined with large investment requirements to threaten company stability.

At the same time, cash flow has slowed, risk has increased and an imbalance of resources has made us overweight. Profit margins are squeezed.

Good business acumen dictates that we respond quickly and decisively. Management has the responsibility to keep the company profitable and viable. Anything less would be shortsighted and would mean abdicating our accountability to our shareholders, employees and our customers.

Our company has had some good innings and will have more. The company's strategy to generate the cash it needs to be strong, stable and competitive is sound. It's a strategy that promises to put General Dynamics' sums correct and benefit employees and customers alike in the long run. That's just going back to basics.

## GD is in defense for the long haul

The new realities of the defense industry—see cover story—require that defense contractors must adapt their strategies and approaches to doing business if they are to be successful in today's environment. General Dynamics is doing just that, and in the process is becoming a stronger, more viable competitor in the industry.

Recently, Chairman and Chief Executive Officer Bill Anders publicly underscored his confidence in General Dynamics' future as a major player in the defense industry, and his commitment to aggressively pursuing defense business that makes financial sense.

Anders said:

“We are strongly committed for the long term to our role as a premier defense contractor. We intend to vigorously compete for new defense business that meets our financial criteria; the Advanced Tactical Fighter is an important example. We intend to be a major factor in the defense business. Our reliable, high-quality products and our financial strength and stability will ensure our role as an industry leader in the years to come. As I said in my 1990 letter to shareholders, ‘We are committed to improving General Dynamics' value to its shareholders, its customers, and its employees.’

“Our commitment to the defense business is underscored in our 1990 annual report in which we discussed with pride and satisfaction the outstanding performance and reliability of our products, which were put to the test of combat in Operation Desert Storm.

“As we compete for new defense business, we will work to compete as a financially strong and stable company with the resources to meet the customer's product requirements. We will only pursue defense contracts that meet reasonable profitability standards. We believe that our major customer shares our view that financially strong contractors are critical to meeting weapons systems performance and quality requirements and preserving a strong U.S. defense industrial base.

“General Dynamics can and will bring the benefits of its increasing financial strength to new business such as the ATF. We are committed to the pursuit of this program and new business reflecting the improved business conditions fostered by current Department of Defense management. We are confident, as we stated in our annual report, that ‘despite the declining U.S. defense budget, opportunities exist for selected new weapons systems development.’

### Korean order bolsters future F-16 production

General Dynamics closed what Vice Chairman Herb Rogers called “probably the single largest sale we're going to see for a few years” when South Korea recently ordered 120 F-16 Fighting Falcons for \$5.2 billion.

Coupled with Egypt's recent order for 46 F-16s, the South Korean sale will preserve between 500 and 1,000 jobs at Fort Worth Division that would have been lost in the mid-1990s as production wound down for the U.S. Air Force.

The South Korean purchase reversed a decision that nation made a year ago to buy McDonnell Douglas F/A-18 Hornets instead of F-16s. But the F-16's lower cost, in addition to its exceptional performance during Operation Desert Storm, helped earn the order for General Dynamics.

“This is an excellent development for General Dynamics' shareholders and employees alike,” said Chairman and Chief Executive Officer Bill Anders. “New international orders will sustain the F-16 production line in Fort Worth as domestic orders gradually decline.”

The South Korean and Egyptian orders are important for two reasons, Rogers said: “It starts us on the way to filling the gap in our production line that is scheduled to occur in the 1995 time period. Secondly, the international program, combined with Air Force procurement, could give us at the Fort Worth Division a viable F-16 production line throughout the 1990s.”

Fort Worth will build an undetermined portion of the 120 aircraft and will supply components for others to be assembled in South Korea. South Korea will also build some of the F-16s under license.

South Korea already operates 36 F-16s and will soon receive four more to complete an earlier purchase. The new order for 120 Fighting Falcons will make South Korea's F-16 force one of the largest among the 17 nations that have bought the aircraft. Eight of those countries have placed additional orders.

Egypt's order for 46 F-16C/D Fighting Falcons totals \$1.6 billion.

The purchase will increase Egypt's F-16 force to 167. Deliveries of two earlier orders ended last July. Production of 47 more is under way. The latest order will be delivered from 1994-96.

### Kapnick's appointment heads executive changes

Harvey Kapnick, a member of the board of directors since 1980, has been elected vice chairman. The 65-year-old Kapnick is president of Kapnick Investment Co., Inc. He was chairman and chief executive officer of two other firms, Chicago Pacific Corp. from 1984-89 and Arthur Andersen & Co. from 1970-79.

General Dynamics recently announced three other executive appointments. Alan C. Chase, 54, was named senior vice president-government relations in Washington, D.C. David L. McPherson, 50, was named corporate vice president and general manager at Air Defense Systems Division. Paul A. Hesse, 49, was named corporate vice president-communications.

### Army buys 1,725 more SINCGARS radios

The Army has exercised its first option to buy 1,725 Single Channel Ground and Airborne Radio Systems for \$22.9 million from General Dynamics and Tadiran of Israel. The Army had already purchased 550 radios. The total value of the program will be \$192.9 million if the Army exercises its remaining two options for a total of 26,875 radios.

### Five employees' children win company scholarships

Five children of General Dynamics' employees have received company-sponsored scholarships of either \$1,500 or \$5,000. They are Rajiv Arora, whose mother, Bonnie, works at Convair Division; Janelle M. Johnson, whose father, Elbert, is at Electronics; Julie A. Kauffmann, whose father, David, is employed at Land Systems; David K. Smith, whose father, James, is at Fort Worth; and Katherine Sun, whose father, Ru-Tsung, works at Space Systems.

## Strategy

(continued from page 1)

and maintenance of the aircraft fleet.

■ We are implementing major changes in management incentive programs to sharply focus attention on a management culture based on a more businesslike approach to those businesses that add value. Businesses that do not add value are undesirable and cannot exist in the long term. This link of management reward to financial performance will add shareholder value. These changes are designed to motivate management to make our company financially strong so that we have the resources to compete effectively in healthy markets over the

long term.

For all salaried and non-union hourly employees, changes to the Savings and Stock Investment Plans include an option to invest all plan funds in company stock and receive a dollar-for-dollar match. In addition, company matching funds to all plan options are in stock. The same plan is being offered to the unions representing much of our skilled work force.

All these changes highlight the immediate goals of our strategy: increasing employee ownership and improving shareholder value.



## Anders thanks employees activated during Gulf crisis

### To General Dynamics reservists and their families:

Congratulations on a job well done!

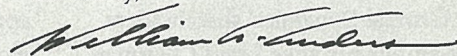
With your help and with the dedication of other reservists like you who served in the armed forces of the United States, Kuwait has been freed. This victory has brought a renewed sense of pride and patriotism to our country and your efforts contributed to that.

As a retired reservist myself with 33 years of service, I know the challenges you have faced in the integration of your professional and military lives for training and drills. But, in addition to your peacetime service, you were called upon when times required real personal sacrifice. Your actual duty during Operation Desert Shield/Storm is recognized and appreciated. Whether you served in the Persian Gulf or elsewhere, your contribution was a part of the team effort that won the war.

General Dynamics is a company dedicated to peace through strength. Just as our products were instrumental in the war's success, so too was your contribution. We salute you for it.

You have my deepest personal thanks and the thanks of all your fellow employees at General Dynamics.

Sincerely,



William A. Anders

**Desert Storm is over. Kuwait has been freed. General Dynamics' products were a critical part of the weaponry used to win the war. We can take great pride in this.**

**We are even more proud of our fellow employees who, as members of the reserves, were activated and served in the armed forces during this crisis. On behalf of all employees, I let these brave men and women know of our pride in their bravery and their accomplishments by sending them the letter reprinted above.**

**We are most grateful, too, for the sacrifice and support given by the families of our reservists called up for Desert Shield/Storm. I know how helpful it was to me to have strong family support and acceptance on the "home front." Like my wife, Valerie, who was my "backup crew" for Air Force and NASA missions, our reservists' families also "served." They have our thanks and they deserve the thanks of all America.**

**Let us hope all our reservists will return home soon. As they arrive, let's show each one our thanks and support.**

Bill Anders

Chairman and Chief Executive Officer

## 'Little studies,' lots of work led to T

**"Saddam Hussein has had many surprises in this war, but one of the best surprises has been the Tomahawk missile."**

—Vice President Dan Quayle, February 1991

**R**obert Lynch, the "father" of General Dynamics' Tomahawk, was not surprised by its performance in the "mother of all battles."

Almost two decades ago Lynch, Walter Locke and Ralph MacKenzie set out on the rocky road that led to the triumphant debut of U.S. cruise missiles in the Gulf War. Locke, now a retired admiral, was a commander and the first cruise missile project manager. MacKenzie was Convair Division's Navy cruise missile program manager and Lynch his chief engineer.

That was in 1972, when the Navy awarded cruise missile study contracts to five firms. Prospects were not bright.

"In the 1950s we just puttered along," said Locke. "At first we even built copies of the German buzz bomb (V-1) of World War II. The cruise missile of those days was just a dumb airplane."

The following decade was that of the ballistic missile, and "for all practical purposes, the cruise missile went out of business," said Locke.

It took two surprises to change all that.

The first occurred in 1967, when Egypt used a Soviet-built Styx cruise missile to sink the Israeli destroyer *Eilat* during the Six-Day War.

"Our defense establishment was stunned," Locke recalled. "We have nothing like that, give us that capability," was their reaction."

But not very much happened until the second surprise in May 1972, when the United States and the Soviet Union signed the SALT I arms-control agreement. Now money was suddenly available from programs prohibited or limited by SALT.

Not a lot of money. "We were working on little studies," said Frank Thompson, current director of Convair cruise missile programs. "Remember, the cruise missile didn't emerge from normal military requirements. At that time, the Navy didn't care much about the cruise missile."

Who would have predicted then that these studies would ultimately lead to Tomahawk, "a high-tech weapon that could change the nature of battle forever," as described by *Newsweek*?

Locke, Lynch and MacKenzie, more likely than anyone else, would have, according to interviews with Navy and General Dynamics people who participated in or were close to the program.

The challenges the three men and their colleagues had to overcome were daunting.

First, the Navy asked for a lot. The

## Words from the war...

How well products work is the most meaningful measure of their success. Eleven General Dynamics' products were deployed in operations Desert Shield and Desert Storm: F-16 and F-111 aircraft; M1 and M60 tanks; SSN 688 submarines; maritime prepositioning ships; Tomahawk cruise missiles; Phalanx and Stinger anti-aircraft systems; and Sparrow and Standard anti-aircraft missiles. Here are comments from the users of some of General Dynamics' products in Operation Desert Storm.

**"And for the F-16 - what a great jet! I just completed my 100th combat hour in the F-16 yesterday, 12 February 1991. Completing 100 combat hours in less than a month was quite an accomplishment for me, but even more says a lot for the aircraft and our aircraft maintenance folks. In the last 27 days, I flew 28 missions without a single ground or air abort, or even late takeoff. Twenty of the flights returned with a code one, discrepancy-free aircraft, and believe me, the aircraft was really being worked out in the target area."**

—Air Force Lt. Col. Billy Diehl, commander of the 17th Tactical Fighter Squadron

**"If they saw it, they killed it."**

—Marine Corps Capt. Mike Ettore on the accuracy of M1A1 tanks



**"The M1A1s are doing damn good. We've only had one (repair) job in the last 30 days. Thank God for General Dynamics and tell your guys at the shop to keep up the good work and we will too."**

—Army Spc. 4 Dean Robinson, an M1A1 mechanic

**"It's just like in training. We get a target, confirm it and fire on it. Killing a tank is something of a letdown. I just never thought it would be this easy."**

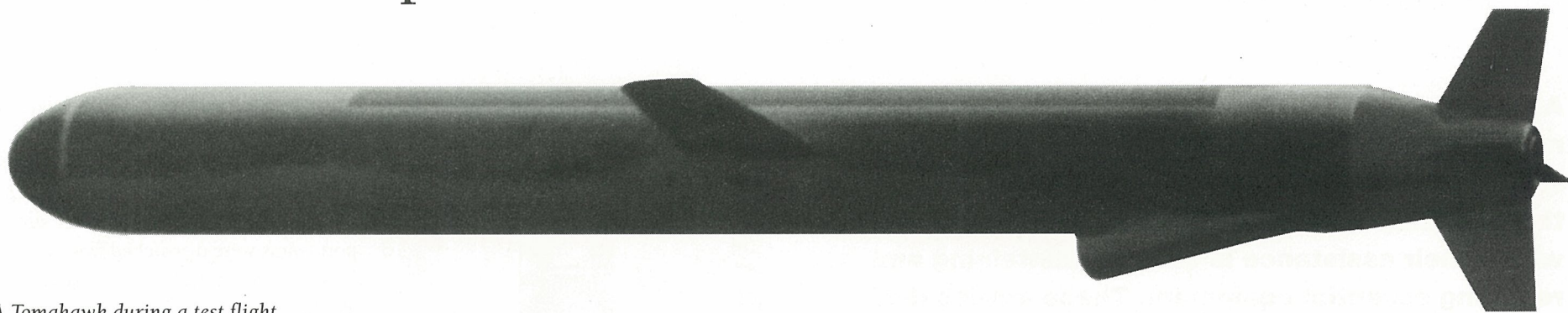
—Army Sgt. Tom Cavanaugh, an M1A1 gunner



A Fort Worth Division F-16 (top) flies a mission during Operation Desert Storm. Land Systems' M1 Abrams tanks (left) from the 24th Infantry Division (Mechanized) patrol the Saudi Arabian desert.



# Tomahawk's triumph



A Tomahawk during a test flight

cruise missile was to be fired from a submerged submarine in the Pacific, fly cross-country so low that it had to pull up over mountains and, when reaching Chicago, navigate to a spot within the base paths of Wrigley Field, according

to Lynch.

Another way of putting it would be: Build us a submersible airplane that can be shot out of a torpedo tube, fly over 1,000 miles and hit the target.

Experience wasn't exactly a guide to

the Convair team MacKenzie put together in early 1972. First-generation cruise missiles had been hindered by large and heavy warheads, inefficient turbojet engines and heavy, power-demanding guidance systems that were also inaccurate.

"MacKenzie's misfits," as they were affectionately known, agreed that the answer to the Navy's request was a design that balanced range, fuel consumption, structure and submarine compatibility.

"And it was the General Dynamics team that came up with a brilliant airframe design," Locke said recently, "because their design gave us a missile that was as hard as a torpedo and able to fly like an airplane."

The Navy's first reaction to the GD design in April 1973 was somewhat less enthusiastic: "abysmally unacceptable."

"MacKenzie and I had a drink," Lynch remembered. "We're finished," I said. But MacKenzie believed now we knew what they didn't like. Dave Lewis, then GD's chairman and CEO, agreed with him. When we went to St. Louis, he gave us \$1 million from discretionary funds to prove that the Navy was wrong in every one of the 10 things they objected to."

Should it be launched vertically from converted nuclear ballistic missile submarines? Or vertically from a new class of attack submarine? There were other options as well.

"In the fall of 1972 I decided that it was to be none of the above," said Locke. "Instead, I wanted to disconnect the (Tomahawk) prototype from all launch platforms. But I also decided that the prototype should be fired from a torpedo tube because that costs far less than modifying a class of submarines."

**"The General Dynamics team came up with a brilliant airframe design... a missile that was hard as a torpedo and able to fly like an airplane."**

—Adm. Walter Locke (Ret.)

Locke's decision paved the way for Lynch's design. (See related story on this page.) The result was "a bird for all uses and all platforms, actually an unmanned little bomber," said John DeBlanc, Convair's vice president-program development.

That kind of adaptability landed Tomahawk in alphabet soup. The sea-launched cruise missile (SLCM) comes in four variants: TLAM-C (Tomahawk Land Attack Missile-Conventional); TLAM-N (also land attack, but nuclear); TLAM-D (land attack with submunition dispensing); and TASM (Tactical Anti-Ship Missile).

It is precisely the "brilliance" and simplicity (at least in hindsight) of Lynch's design that permitted evolution of the Tomahawk into a family of weapon systems able to perform a mix of strategic and tactical missions.

And perform them with extraordinary effectiveness, as the Gulf War proved. Locke, Lynch and MacKenzie must have been pleased with reports of Tomahawk's success against Iraqi air defenses in the opening round of Operation Desert Storm.

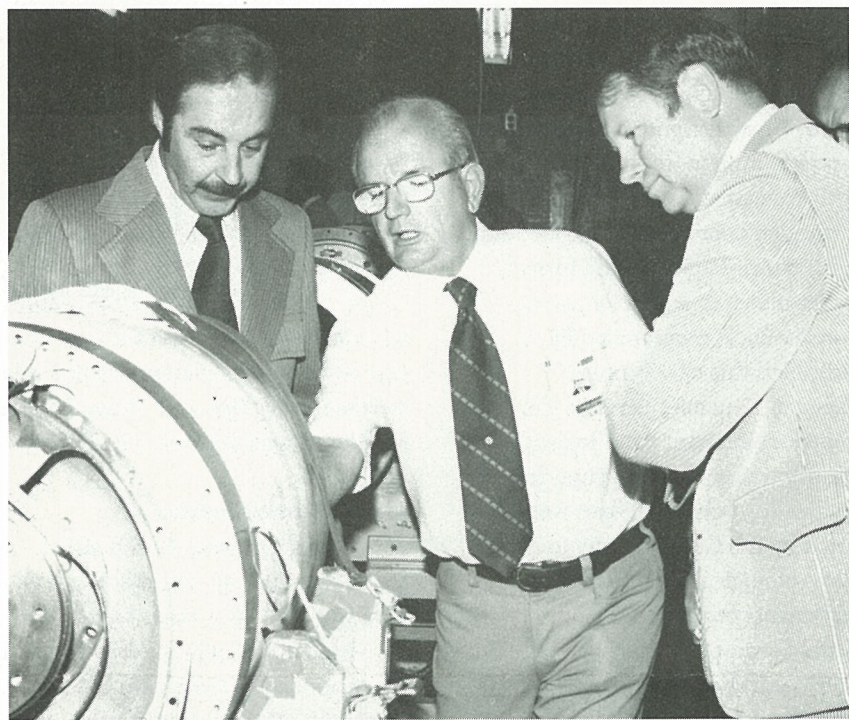
Or with the apocryphal description on Cable News Network about the Tomahawk that paused and then turned on its way to the defense ministry in Baghdad.

But they probably were most pleased with what defense analyst Anthony Cordesman said about Tomahawk.

"One key lesson we have learned from this war is that the United States must plan and design systems that will absolutely minimize casualties," Cordesman said.

And that, he said, is what Tomahawk does.

☞ George Salamon



Bob Lynch (center) makes a point about a Tomahawk test missile to Ralph MacKenzie (left) and Walter Locke, circa 1975.

## Design story: a capsule summary

The Navy tested kerosene fuel that was to be used in Tomahawk cruise missiles by rubbing it on monkeys. The monkeys not only didn't show any aftereffects, they loved it, recalled Convair Division's then-chief engineer, Robert Lynch.

Any possible problem from a Tomahawk fuel leak aboard a submarine was one of many issues that had to be resolved before the missile could be deployed. Hence, the monkey tests.

The key concern for General Dynamics and Vought, the two companies selected as finalists in the competitive airframe development program in 1974, was how to reconcile the requirements for survivability in a submarine environment with those for flight performance.

The two firms chose opposite approaches. Vought built the strength into the airframe itself, producing a thick, heavy-walled missile. Lynch and his colleagues chose encapsulation.

"We decided to separate the structural underwater requirement from the flying airframe," said Lynch. "We looked at the Navy's Mark 48 torpedo, which was transported into the torpedo room in a capsule that was taken off there. But the Navy didn't want its torpedo rooms littered with useless capsules."

Lynch devised a capsule that could be put into the torpedo tube and ejected after the missile's firing. "The capsule is like a shell casing after a gun is fired," Lynch said. "After hydraulic pressure forces the missile out (of the torpedo tube), the next pulse of water pushes the capsule out."

While that may sound easy, the design details, such as the dotted sleeve of the capsule that must move to allow the capsule itself to be ejected, proved immensely complicated and challenging.

These details were in place by 1977. General Dynamics was chosen as prime airframe contractor that March. Tomahawk had become, in Lynch's words, an "aeroplane with a bomb bay."

Navy officials were still skeptical about Tomahawk's stowed wings. The wings, which open while the booster is still firing, do not open evenly. One wing leads the other. As a result, Lynch said, "the missile may fly cockeyed for 2 seconds. But so what?"

So what indeed. By the time a Tomahawk was making its turn toward Iraq's defense ministry last Jan. 17, it was flying right.

☞ George Salamon

**"We were working on little studies. Remember, the cruise missile didn't emerge from normal military requirements."**

—Frank Thompson

It took MacKenzie's misfits five years to do just that. "All the technical decisions on Tomahawk were really made by 1977," Locke said, "and proven by the summer of 1978."

But getting there was neither easy nor smooth.

Even the origin of the missile's name is disputed. Does it come from the legendary Indian hatchet or was it named after the boarding ax British sailors used to seize or disable an enemy ship?

"It started with the Indians and was used by early English sailors," said Bob Holsapple, until recently public affairs officer for the Joint Cruise Missile Project.

The Tomahawk started without a clear mission as well. At first, it was perceived as a strategic nuclear missile. Then it was seen as an anti-ship weapon. Only one thing did seem certain: Tomahawk was to be deployed on submarines.

But it had not been decided, in early 1972, just what the launch platforms and the mode of launch would be.



# General Dynamics' field representatives go where the action is

**As their job title implies, General Dynamics' field representatives work where General Dynamics' products are used. Field reps go where the customer goes. In times of war, that means near-or even to-the front, where their assistance is vital in maintaining and repairing essential equipment. These stories detail the work of company field reps during the 100-hour land war in the Persian Gulf.**

## On the go in the Gulf with GD's reps

**P**itching bedouin tents. Avoiding rain-filled tank ruts that swallow pickups whole. Repairing 60-ton combat vehicles at night by flashlight. Preventing desert grit from fouling equipment. Interpreting foreign-language instruction manuals.

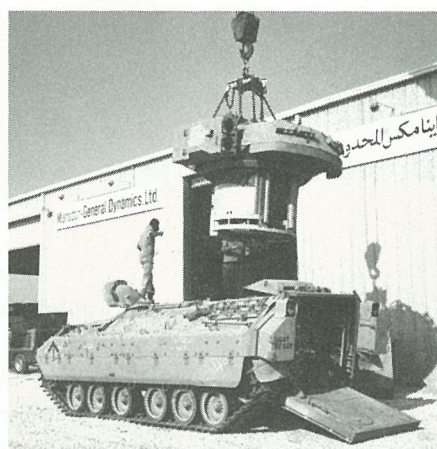
Skills not found in the ordinary resume. Yet all were demonstrated routinely by General Dynamics Services Co. and Land Systems Division personnel supporting United Nations forces in the Persian Gulf war.

For General Dynamics Services Co.'s Jim Greenberg, director-Saudi programs, a harbinger of war arrived at 2:30 a.m. Aug. 23. That's when he received a call from the U.S. Army's Tank Automotive Command in Warren, Mich. Could he

have a combat vehicle support team in place at Dhahran in 24 hours?

Later that same morning, Greenberg and Bill Schenck, program manager-Saudi M60 tank conversion, pulled together a start-up crew and left Taif, General Dynamics Services Co.'s primary Saudi facility. "We had a team in place within 24 hours, complete with sufficient vehicles, administrative equipment and people," Greenberg said. "We added 25 maintenance technicians and activated a 20,000-square-foot maintenance facility within seven days."

Before the Iraqi invasion of Kuwait, more than 600 General Dynamics Services Co. employees were in the Middle East working on the Saudi M60 tank upgrade, three Egyptian armored ve-



A Bradley infantry fighting vehicle receives attention from General Dynamics Services Co. employees during Operation Desert Storm.

hicle programs and support of Bahrain's and Egypt's F-16 fighters.

When Operation Desert Shield commenced, General Dynamics Services Co. began recruiting more than 200 employees to maintain U.S. Army tracked and wheeled combat vehicles, including Abrams tanks. Michael Huff, former program manager on one of several armored vehicle programs in Egypt, spearheaded this new venture.

General Dynamics Services Co. also provided maintenance and logistics support for more than 60 Thyssen Henschel Fox vehicles. Foxes were contributed by the German army to detect nuclear, biological and chemical contaminants on the battlefield.

Land Systems, meanwhile, had 32 field service representatives in the Persian Gulf to help activate arriving tanks,

provide supplemental crew training, and diagnose and fix any problems.

General Dynamics Services Co. operated from two bases in the Dhahran-El Khobar area. Mobile maintenance support teams were dispatched from these bases to work in the field. Employees ate the same Army rations as the troops, jumping from location to location as preparations for the final assault were made. Reps lived as nomads, even sleeping in bedouin tents.

"Our average work week was 90-100 hours, pulling maintenance at night with flashlights and headlights of cars," said Greenberg.



General Dynamics Services Co. employees pose with two types of equipment they helped maintain during Operation Desert Storm, an M1 Abrams tank (left) and a Fox vehicle.

### Identification crisis

Those supporting Fox vehicles found mechanical problems the least of their worries. Allied forces were not familiar with the Fox, which eerily resembled the silhouette of a standard Soviet armored personnel carrier used by Iraq.

## Desert Storm snapshots: General Dynamics products go to war



One of the 1,956 M1A1 Abrams tanks in Operation Desert Storm move through the desert. Seven M1A1s were hit by rounds from Iraqi T-72 tanks but were not damaged; of the eight Abrams tanks damaged during the campaign, only four were not repairable. No U.S. tank crews were killed in tank battles.



F-16 Fighting Falcons flew almost 13,500 sorties—the highest sortie total of any aircraft type—in Operation Desert Storm. F-16s maintained a 95.2 percent mission capable rate, five percent above their peacetime rate.



**"GD people" is a regular feature. Employees wishing to submit information for possible use should contact their division or subsidiary public affairs offices.**



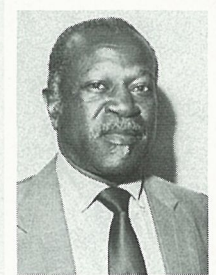
**Bill Campbell**  
Fort Worth

Campbell, a technical publications editor and 20-year Air Force veteran who served in Vietnam, is a source of patriotic pride for fellow employees. He and his wife Claudia have spent their free time since the beginning of Operation Desert Storm making more than 1,000 American flag pins with yellow ribbon cascades and have given them to Bill's co-workers. The Campbells vow to continue making the pins as long as demand continues. "The time and small amount of money we spend are the least we can do," he says.



**Barbara Kirkland**  
Fort Worth

Secretary Kirkland is the founder of "Grandparents Raising Their Grandchildren," a 3-year-old group that has spread to the Midwest and the West Coast. The non-profit organization helps grandparents answer emotional, legal and financial questions about assuming parental roles for grandchildren. She and husband Jerry have been raising their 10-year-old granddaughter, Trisha, since birth. Several network television shows and national magazines have featured the Kirklands.



**Shelley White**  
Convair

Field Custodial Supervisor White has been picked to umpire in this year's Little League World Series in Williamsport, Pa. White's work during past regular seasons resulted in selections to call the 1983 Western Regional Little League Tournament, the 1985 Junior League World Series, and the 1986 Little League and Senior League Softball World Series. Like other Little League umpires, White receives no pay or travel expenses.

Larry Wise, program manager-Desert Fox, visited allied air bases to help aviators recognize Foxes during their missions. "With the addition of a wheel on either side, you could be mistaken for Soviet or Iraqi equipment," said Wise. "We sent out posters and talked to pilots to make sure they knew we were the good guys."

Danger also lurked for those driving the Toyota pickups used as support trucks for the Foxes, according to Ron Hairstone, team chief-Desert Fox and a former Marine. Intelligence sources indicated that Toyotas could be used by terrorists to attack the allies. "Consequently, we had a lot of helicopters look us over pretty carefully in the field,"

Hairstone said.

The ability to move tools, parts and people quickly across a 900-kilometer (550-mile) battlefield became a virtue for many General Dynamics Services Co. technical representatives. Larry Armand, contact team supervisor-Desert Shield, logged 2,800 kilometers (1,700 miles) with an assistant driver in 24 hours. Greenberg amassed 2,500 kilometers (1,550 miles) in 2 1/2 days, but said, "I had to hang my head when I heard about Armand's record."

Covering long distances was routine in a dry desert, but rains could turn the terrain into a mucky trap. Bruce Mason, operations supervisor-Desert Fox, spent many hours hopelessly mired in sand.

## Employees rescue Gulf wildlife

General Dynamics Services Co. employees who helped coalition forces defeat Saddam Hussein during the Gulf War are also helping beat the Iraqi dictator on another front.

They are rescuing wildlife and repairing some of the massive environmental damage wrought by the Iraqi oil spill in the Persian Gulf.

The employees are involved in a conservation program established by the Saudi government under the auspices of the U.S. National Commission for Wildlife Conservation Development. The program is based

near Jubayl just north of Dhahran.

"We're collecting the medicines, fish food, plastic aprons and gloves needed to support the volunteers who are here to clean the animals," said Jim Greenberg, director-Saudi programs. "Our employees have also raised \$41,000 for the effort so far."

Mobil Corp. and other companies have made pledges to sustain the conservation work. Those interested in contributing can reach Greenberg c/o Mansour General Dynamics Limited, APO New York, NY, 09038. **Chris Schildz**

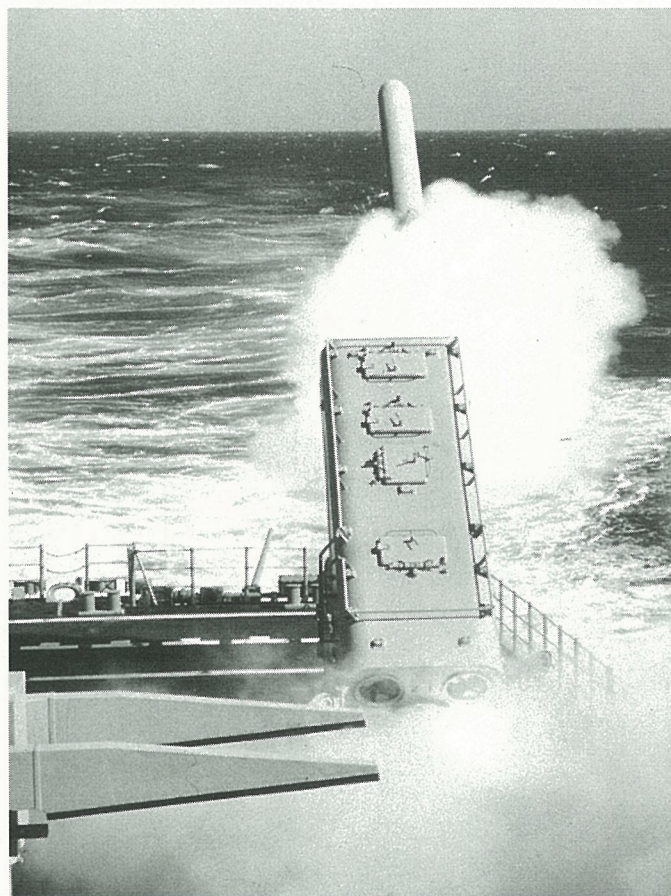


U.S. AIR FORCE

One of the 109 F-111s (top) employed in Operation Desert Storm flies a mission. An Army trooper operates a Stinger anti-aircraft weapon (right).



U.S. ARMY



U.S. NAVY

A Tomahawk cruise missile heads toward its target during Operation Desert Storm.



# Federal Express is sold 100 percent on Caravan's 99.5 percent reliability

When Federal Express recently captured the Malcolm Baldrige National Quality Award, Cessna Aircraft Co. was silently wearing its own proud medal.

**T**he Baldrige award is presented annually in recognition of U.S. companies that excel in quality achievement and quality management. Cessna's commitment to total quality management was a major factor in helping Federal Express capture the honor.

For the last three years, Federal Express has used Cessna's Caravan 208 aircraft to deliver goods to approximately 30 percent of the zip codes that the company services. The dispatch reliability rate for the aircraft has run better than 99.5 percent, according to Pete Carney, manager-feeder aircraft operations for Federal Express.

"Reliable service is what Federal Express strives for and Caravan provides that for us," Carney says.

Adds Reid Jewett, manager-contract services at Cessna: "Service is all Federal Express has to sell, so reliability of the Caravan is very important. I really don't think Federal Express expected that kind of reliability from a general aviation aircraft."

Federal Express looked hard at various aircraft before picking the Caravan to service small feeder cities where larger aircraft cannot land, according to Carney.

"The Caravans serve a unique role in the Federal Express system," he says. "The planes give us a high degree of reliability at a moderate cost to expand our



The Caravan meets Federal Express' need to service cities where larger aircraft can't operate.

service in the type of areas they serve."

The Caravan is easy to maintain, cheap to operate and flexible enough to take on the responsibilities of a larger aircraft, according to Carney.

Federal Express flies 190 Caravans in the United States and 12 overseas and in Canada.

"Needless to say, we're very pleased with the Caravan's performance," Carney says. "It's a simple, well-built aircraft. It's a good plane, built by good people."

The Caravan's success with Federal Express has helped sales of the plane throughout the country, Jewett says.

"Many customers look at the experience Federal Express has and the success the company is having with the Caravan," he says. "The plane is just so

visible with Federal Express. There's no other plane quite like it for its size and performance range. It's that unique.

"Even other freight companies that haven't bought the plane have hired operators who in turn lease Caravans from Cessna."

Approximately 450 Caravans have been sold since the aircraft went into production in 1985. The Caravan has seen a wide variety of service. It has been used to help feed Ethiopians in the desert; as an island hopper in Hawaii; on floats in Alaskan lakes; and in northern Ontario to run fuel oil and supplies for people in the wilderness.

"It's a unique plane," Jewett says. "And it certainly is versatile."

Myron Holtzman



Cessna employees work on new Caravans.

## 'New' GDWorld debuts

The world has a new look. GDWorld, that is.

The monthly employee publication has been redesigned to improve readability and save money. This issue marks the premier of the remodeled *General Dynamics World*.

Redesign work focused on:

- **Content.** More space is being devoted to business issues facing General Dynamics. Several new items, such as "GD people," are standard monthly features. Less space is given to "hard news" because, realistically, a monthly publication such as *GDWorld* can't be current.
- **Production costs.** To cut production costs, full-color photographs have been replaced with black-and-white half-tones.
- **Layout.** The publication looks more like a magazine than a newspaper because "hard news" is no longer stressed.
- **Environment.** *GDWorld* is printed on recycled paper that exceeds minimum federal standards.

Your comments on the "new" *GDWorld* are welcome. Send them to:

Dave Lange, Public Affairs Office  
General Dynamics Corp.  
Pierre Laclede Center  
St. Louis, MO 63105

Address EM/OS messages to LANGE,DA.

### GDWORLD

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**Editor:** Dave Lange, corporate manager-internal communications

**Designer:** Bruce McIntosh, corporate graphics administrator

**Contributors:** Julie Andrews, Dan Barrett, Pete Connolly, Graham Gavert, Donald Gilleland, Myron Holtzman, Dean Humphrey, Jerry Littman, George Livesay, Pat Moritz, Karl Oskoian, Jack Price, George Salamon, Chris Schildz, Eric Solander, Peter Stamos, Joe Stout, Joe Thornton



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# GDWorld

Published for employees of General Dynamics Corporation

Volume 21 Number 4 June 1991

## First six months of '91 see start of new strategy to boost GD in defense, commercial markets

The following letter is from Chairman and Chief Executive Officer Bill Anders.

**D**ear Fellow Employees,

At the end of June, I will have completed six months at the helm of GD. It has been anything but dull.

Since Jan. 1, our country has gone to war in the Middle East and emerged victorious, with substantial thanks to the people and products of General Dynamics. We were jolted with the abrupt cancellation of a multibillion-dollar program, the A-12. We won major new contracts to build, among other things, the Navy's newest submarine, the Air Force's newest fighter aircraft and a major addition to Korea's F-16 fleet. We developed and began to implement a new strategic direction designed to make us a stronger, long-term competitor in both the government and commercial marketplaces. We are planning and adjusting for the future.

When I became chairman, I inherited a company with real strengths—

- A skilled and dedicated work force;
- Modern facilities and equipment;
- A strong technical base;
- A proud tradition of developing and producing fine products for both our government and commercial customers;
- A profitable, well-positioned and growing commercial sector;
- A total backlog of over \$23 billion;
- A commitment to high ethical standards, quality and customer satisfaction.

But while our company has strengths, it and the defense industry, which we depend upon for over 80 percent of our sales, have major problems.

The products you developed and manufactured to make the world a safer place worked—so well, in fact, that the United States is now diverting to domestic concerns many of the dollars that would have gone to defense.

The Berlin Wall has fallen. The Cold War is over. The Soviet threat is greatly diminished. There will still be conflicts in the world, as we witnessed in the Persian Gulf, which will require a strong defense. But our defense establishment is shrinking at an alarming rate.

The defense industry has been badly shaken. Total industry debt is at its highest level in years and returns are at historic lows. Large write-offs have become almost commonplace, including one by GD for \$1.3 billion last year! The industry is plagued by overcapacity, and its stock prices remain undervalued.

Though our company has some of

"GD will have the strength, the people, and the resources to not only survive but to be a winner. It will not be easy, but winning is exactly what we intend to do."

the most successful defense products and capabilities, its financial performance is among the lowest of our peers. This not only is ironic, it is dangerous and cannot continue. Some of our competitors may not survive the increasingly trying conditions ahead. But, so there can be no confusion, GD will have the strength, the people, and the resources to not only survive but to be a winner. It will not be easy, but winning

is exactly what we intend to do.

The task that the board of directors charged me to undertake was first to thoroughly analyze our market and assess our strengths and weaknesses, and from that develop an appropriate strategy for meeting the challenges of our business head-on. The strategy that your management team has developed is designed to assure the company's future. It is imperative that we recognize and respond rapidly and appropriately to the new realities of the business environment. A major objective is to promptly increase the company's financial health, readjust our planning to a more realistic outlook for the marketplace, size our

(continued on page 8)

## SSIP plans' changes connect employees' interests with those of General Dynamics' shareholders

■ The team of Lockheed, General Dynamics and Boeing wins the Advanced Tactical Fighter competition on April 23.

■ Electric Boat Division captures the Navy contract on May 3 to build the second *Seawolf* submarine.

■ Cessna receives orders of more than \$140 million in April for the CitationJet, Citation VII and Citation X.

■ General Dynamics stock rises to a 52-week high of \$40.00 per share on May 7.

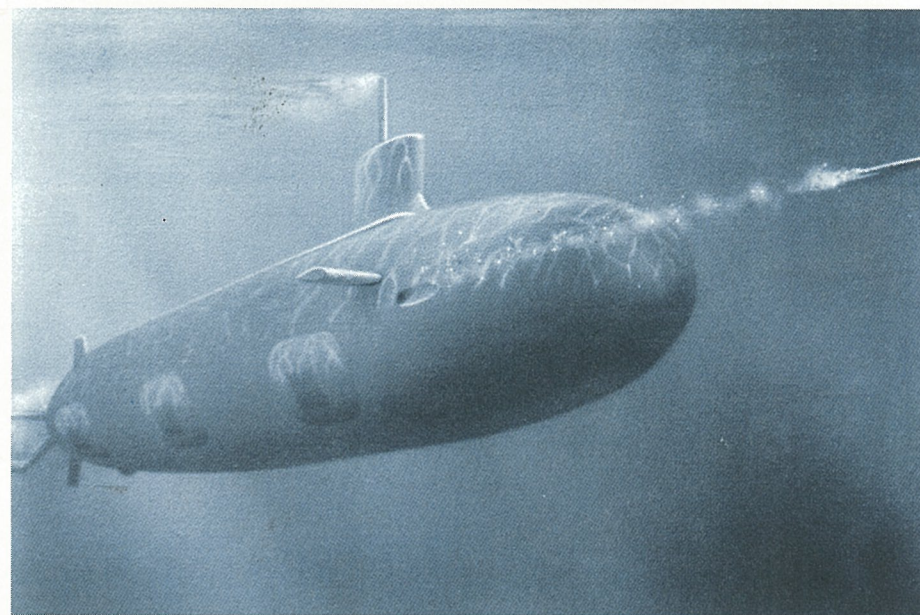
**"G**reat," says an employee. "So what's in it for me?"

Plenty, if the employee also happens to be a shareholder.

When persons are both employees and investors in a company, they have a lot going for them. This partnership of employment and ownership of company stock is what General Dynamics is creating: a link between personal job performance and financial benefit.

General Dynamics is ensuring that benefits from its strategy of improving the strength of the company are available to every employee. The company recently restructured its Savings and Stock Investment Plans to maximize opportunities for employees to become shareholders:

- The plans for salaried and non-union



The day-to-day work of employees who contributed to recent successes with the *Seawolf* submarine (above), F-22 Advanced Tactical Fighter and Cessna's business jets is an example of how employee performance directly impacts the bottom line and investments in the Savings and Stock Investment Plans.

vantage of the match in company stock. Participation in plan options involving the purchase of company stock has risen from 13 percent before implementation of the new plan in February to 40 percent.

Those employees who have elected to buy company shares in the Savings and Stock Investment Plans are already

(continued on page 8)

### INSIDE GDWorld:

#### Taking stock 2

Here are the ins and outs (and ups and downs) of the stock market.

#### Perspective 3

Fewer defense dollars, fewer defense jobs. The two are inseparable.

#### Big victories for GD 4

General Dynamics scores important triumphs by teaming with Lockheed and Boeing for the Advanced Tactical Fighter contract and by winning the order for the second *Seawolf* submarine.

#### Important parts 6

Land Systems Division's Scranton Plant plays a major role in supplying parts for one of Operation Desert Storm's star performers, the M1A1 Abrams.

#### Ergonomics 7

Simple changes now can prevent injuries later.



# Stock primer: Key ratios reflect shares' real values

The ideal way to buy stocks would be with a crystal ball.

Those of us who don't have a crystal ball must make do with stock market advice in newsletters, magazines and newspapers.

**A**mong the eager readers of such columns are approximately 11,000 active and retired General Dynamics employees who jointly hold more than 1.2 million shares of company stock.

All stocks are not created equal. That's the lesson many holders learn annually, with pleasure or with regret. To follow the fortunes (or misfortunes) of your stock or stocks, knowledge of some of the terms used to assess their performance may be helpful.

One important number for any stock is its price/earnings (p/e) ratio, which is the market price of a share of common stock divided by the earnings per share (eps) for the previous 12 months or the estimated eps for the current year.

GD's p/e ratio, based on the \$39 per share stock price in mid-May and a 1991 eps estimated by Wall Street analysts to be \$5.60, is about 7.0. That means investors are willing to pay seven times this year's estimated earnings for a share. The company's current p/e ratio is a significant improvement over the p/e ratio of 4.5 at the end of 1990. The 1990 p/e ratio of 4.5 left General Dynamics 497th out of 500 companies rated by Standard and Poor's Index, even though General Dynamics was 48th in sales among 500 companies ranked by

Fortune magazine. This is clearly unacceptable to any investor.

The increase in General Dynamics' p/e ratio reflects the acceptance of the company's strategy to enhance shareholder value. Still, the current p/e ratio for General Dynamics is below the average p/e ratio of 7.7 for the aerospace industry and well short of the 17.2 average p/e for Standard and Poor's 500. Clearly, there's room for improvement.

What does p/e ratio mean for General Dynamics' employees? The higher a company's p/e ratio, the easier it is for the company to raise funds for research and development, for modernizing plants and equipment, and for pursuing new business. These investments are the keys to building a strong future and stable employment at General Dynamics.

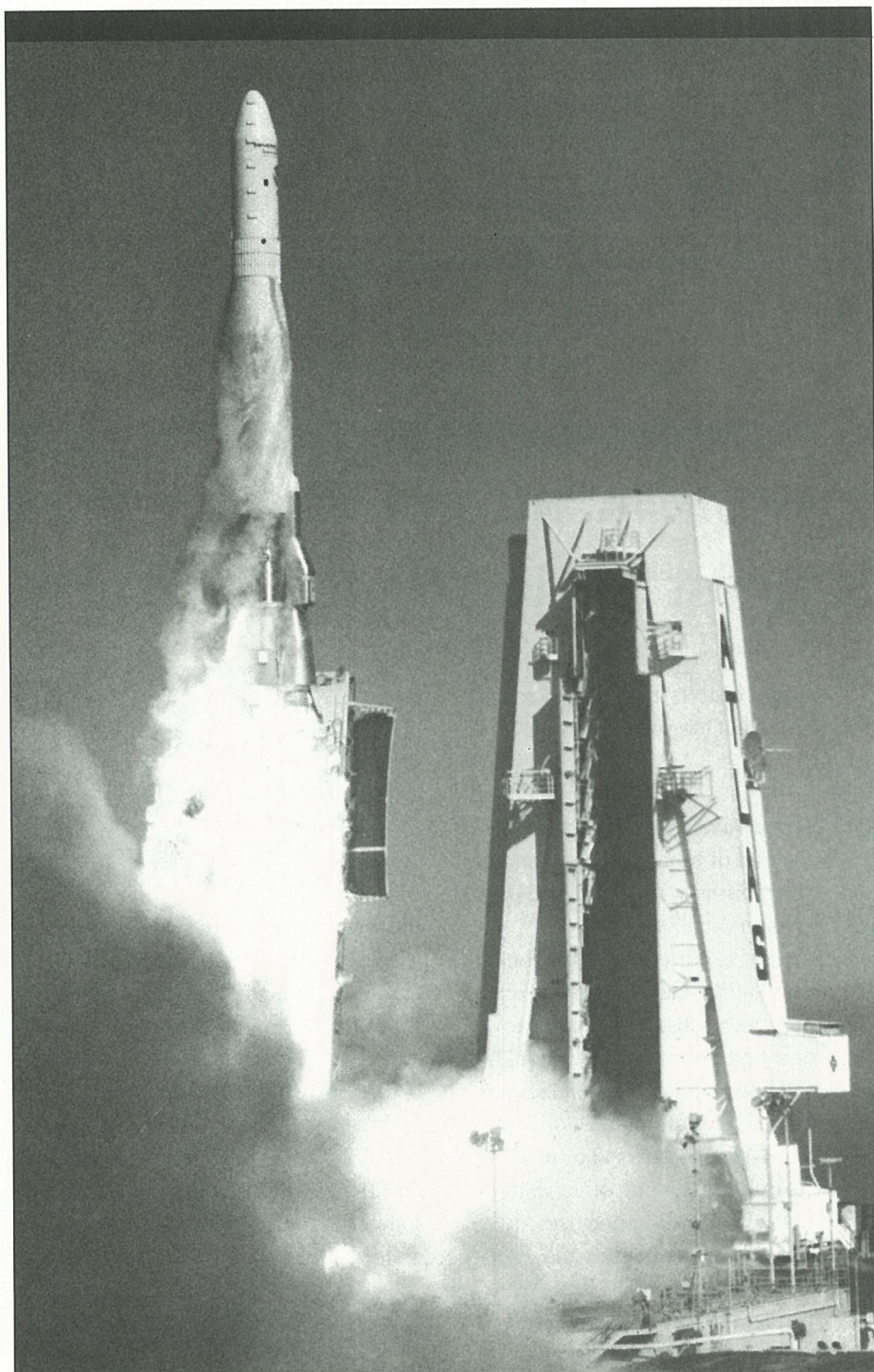
What does p/e ratio mean for the general public? A company's p/e ratio reflects a perception of the company's strengths and prospects for the future. Overall, popular stocks have high p/e ratios and stocks that are unpopular have low ones.

Aerospace/defense firms have traditionally been valued at 25 percent to 40 percent below the stocks of the 400 industrial companies that are indexed by Standard & Poor's Corp.

The traditional roller coaster ride of aerospace stocks was generally associated with the up-and-down cycles of U.S. defense spending and changes in international politics or security.

Shareholders of GD and other defense firms may, therefore, want to ex-

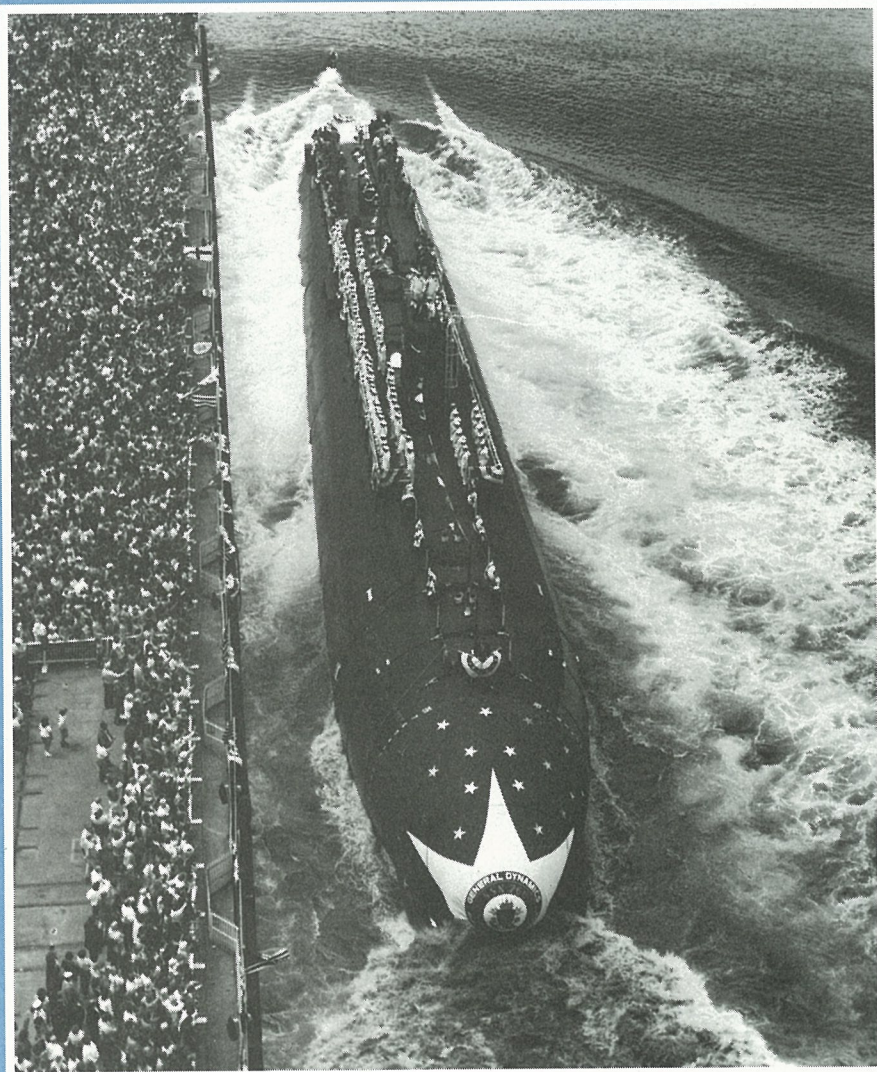
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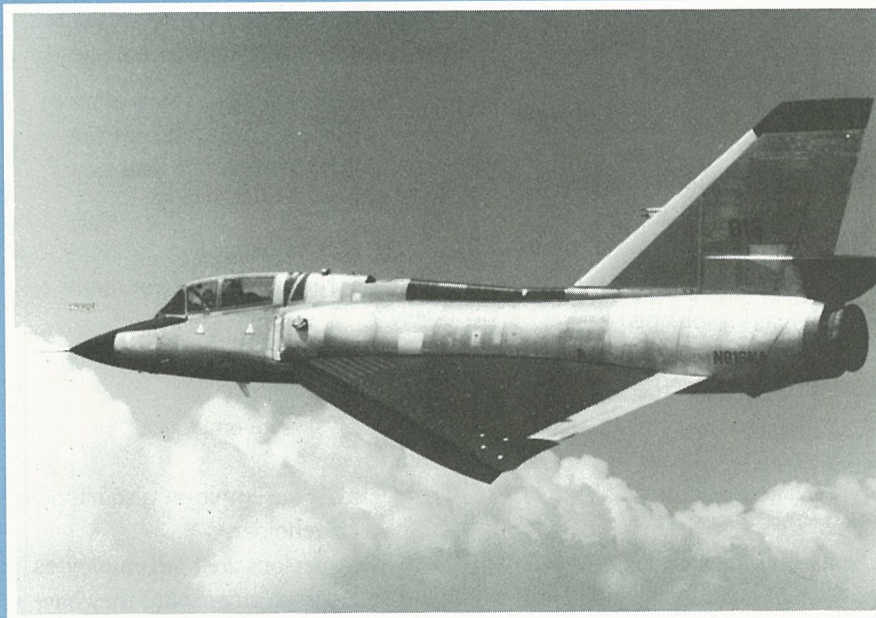
U.S. AIR FORCE

**Turning up 21.** A General Dynamics/Air Force Atlas rocket lifts off from Vandenberg Air Force Base, Calif., May 14, carrying a weather satellite into orbit. The event was the 21st consecutive successful Atlas launch from Vandenberg, the longest-running streak in the world today.

## A beginning and an end



JOHN VERDUN



NASA

The *Annapolis* (left), an SSN 688-class nuclear attack submarine, slides into the water during its launching at Electric Boat Division May 18. Meanwhile, the last piloted Convair F-106 Delta Dart (above) made its final flight April 30. The *Annapolis* is the latest of 28 SSN 688-class submarines built by Electric Boat. The submarine will be commissioned by the Navy after it successfully completes sea trials. The pictured Delta Dart served more than 30 years as a research aircraft and will be retired to the Virginia Air & Space Center in Hampton for display with other historical aircraft. Convair built 340 F-106s as high-speed interceptors from 1956-60. The remaining flyable F-106s serve as drones.



## The painful—yet vital—process of renewal

It's no big secret that there are fewer employees at GD than there used to be. There are also a lot fewer defense dollars than there used to be.

That's because the two are inseparable.

The process of laying off employees is hard on everyone. Ideally, GD would like to employ more people, not less. But these are not ideal times. The defense market—our market—is shrinking because the threat to the free world's security posed by the Soviet Union and the Warsaw Pact is diminishing.

GD's work force and production capacity were built for annual Department of Defense budgets that bought hundreds of F-16 fighters and M1 tanks to counter this threat. As the threat dwindles, so do the production numbers. Latest budget requests call for annual numbers of less than 100 for F-16s and M1s. Similar procurement reductions are in store for most of our other defense products.

That translates into less work. Maintaining the same employment and production capacity would be inefficient, costly and irresponsible. Without enough business to keep everyone working and facilities fully utilized, profits would fall and a weak, less competitive company would result. And the end result would be that shareholders—including employees—who entrust their investments to GD would lose money.

Therefore, General Dynamics must focus on renewal of its strategic direction and replacement of "old ways" with more efficient and productive ones for the new environment of the 1990s.

Regarding this environment, Chairman and Chief Executive Officer Bill Anders, in a *Wall Street Journal* quote that has been widely misinterpreted as referring to all employees, said, "They're all a little nervous and that's exactly where I want them."

In explaining the quote Anders said, "First of all, I was referring to senior management. To me, if they're not always a little nervous, they're complacent. And let me tell you, there's no room for complacent leadership in this new environment."

Ensuring leadership is not complacent, scaling down production capacity, increasing productivity and reducing the size of the work force are key ways General Dynamics is adjusting to declining defense budgets. But these actions create pain—both to the employees and to the organization itself.

The company is working hard to minimize the pain. Every effort is being made to reduce employee numbers through attrition—retirements and other voluntary departures—rather than through layoffs. If the company can continue to win new business such as the Advanced Tactical Fighter and the second *Seawolf* submarine, General Dynamics will not have to cut the work force as much as originally thought.

Still, reductions of some size will accompany General Dynamics' process of renewal and replacement. This process of renewal and replacement is a lot like going to the dentist with a bad tooth. You know it's going to be painful. But if you don't go, the problem gets worse. Left alone long enough, your overall health will decline. So you put up with the pain at the dentist's office for the gain of better health.

GD is taking decisive action now to put us on the road to long-term health. The pain will be with us for a while. But in the long run, GD will be a healthier company for the benefit of our employees, our customers and our shareholders.

### SSIP

Annual rate of return for the 12-month period ending:	Apr. 1989	Apr. 1990	Apr. 1991
<b>Salaried</b>			
Government bonds .....	7.3%	7.6%	11.8%
Diversified portfolio .....	26.1%	10.0%	15.8%
Fixed income .....	10.6%	10.1%	9.9%
<b>Hourly</b>			
Government bonds .....	7.5%	7.7%	11.6%
Diversified portfolio .....	26.1%	10.0%	15.8%
Fixed income .....	10.6%	10.1%	9.7%
<b>GD stock closing price:</b>	<b>\$55.87</b>	<b>\$34.75</b>	<b>\$37.62</b>

## Defense budgets, new business determine size of work force

Numbers attract attention when they represent people. When General Dynamics executives mentioned at the recent annual shareholders meeting that the work force might be reduced by as much as 30 percent over the next few years to match declines in defense spending and to improve productivity, it was reported and widely repeated that General Dynamics would cut 27,000 people—30 percent of the present work force.

However, the estimate of a 30-percent cut was based on a conservative scenario for internal planning.

Fortunately for us, recent contract wins and more future business will reduce the estimate.

Another misconception of work force reductions is that all the cuts will consist of layoffs. The fact is that a significant portion of these reductions will come through retirements and other voluntary means.

Exactly what these numbers will be depends on:

- 1) future defense budgets;
- 2) GD's share of the market;
- 3) better productivity to help win more business.

### Mid-Life Update adds \$2 billion in F-16 work

The Air Force/General Dynamics F-16 Mid-Life Update program was cleared for takeoff recently when Belgium became the last of five nations to complete a letter of offer and acceptance. The letters permit the Air Force to authorize program funding and begin full-scale development.

Full-scale development is valued at about \$400 million and will likely lead to a retrofit kit production program extending through the 1990s. Mid-Life Update will provide advanced avionics for about 530 earlier-generation F-16s and new-production F-16As and Bs flown by Belgium, Denmark, the Netherlands, Norway and the United States. The program could be extended to include about 200 F-16As and Bs flown by other nations. Full-scale development, retrofit kit production and associated work could total as much as \$2 billion.

"European acceptance of the MLU proposal marks additional good news for General Dynamics' multinational F-16 program, closely following the March and April announcements that Korea and Egypt will purchase additional aircraft," said Herb Rogers, vice chairman and general manager of Fort Worth Division. "This brings additional business to our corporation, additional work to the Fort Worth plant and further assurance that the F-16 program will be going strong throughout the 1990s."

### Cessna soars on wings of Citation performance

The Citation series of business jets provided Cessna Aircraft Co. with a host of highlights in recent months.

Orders received in April for the CitationJet, Citation VII and Citation X models topped \$140 million. The next-to-last day of the month saw the first flight of the CitationJet, Cessna's new light business jet. Meanwhile, Cessna delivered its 100th Citation V less than two years after beginning de-

liveries of the eight-passenger aircraft.

These Citation successes led Cessna to increase its share of the world's light and medium business jet market to 62 percent, Cessna's highest ever.

### Atlas extends streak; program backing pledged

A General Dynamics/Air Force Atlas rocket successfully launched a weather satellite at Vandenberg Air Force Base, Calif., May 14 for the National Oceanic and Atmospheric Association. The launch marked the 21st consecutive success for the Atlas from Vandenberg, the longest-running string of consecutive launch successes in the world today.

Meanwhile, Chairman and Chief Executive Officer Bill Anders told Atlas workers that "the corporation is behind you and we know the future holds success" following the failure of an Atlas/Centaur booster to launch a Japanese communications satellite April 18 at Cape Canaveral Air Force Station, Fla. The cause of the failure is under investigation.

### Vice presidents named at Corporate, Marine

General Dynamics recently appointed four men vice presidents. Tom Gavin has been named corporate vice president-taxes and Rick Johnsen has been appointed corporate vice president-treasurer. The Marine, Land Systems and Services Group in Washington has named Joe Doyle vice president-finance and Don Norman vice president-human resources.

Gavin joins General Dynamics from AM International in Chicago. Johnsen comes to the company from PACCAR Corp. in Bellevue, Wash. Both will report to Senior Vice President and Chief Financial Officer Jim Cunnane.

Doyle and Norman were vice presidents at Electric Boat Division. They will report to Executive Vice President-Marine, Land Systems and Services Jim Turner Jr.



**Falcon's wings.** Chairman and Chief Executive Officer Bill Anders (right) recently presented a bronze sculpture (on table) of a "Fighting Falcon" to the U.S. Air Force Academy in honor of academy graduates who flew or maintained General Dynamics F-16 Fighting Falcons in Operation Desert Storm. Lt. Gen. Charles R. Hamm (left), superintendent of the U.S. Air Force Academy, accepted the sculpture. F-16s flew more missions than any other aircraft in Desert Storm and compiled a 95.2 percent mission capable rate, 5 percent higher than their peacetime rate.

U.S. AIR FORCE



# Fort Worth's flight controls help F-22 become fighter of future

**G**eneral Dynamics will be one of the builders of the Air Force's fighter of the future. That came to pass on April 23 when the Air Force awarded an \$11 billion full-scale development contract to the team of Lockheed, General Dynamics and Boeing to build its Advanced Tactical Fighter.

The team won the award with its YF-22 design. Two prototypes demonstrated the design in an intense flight program late last year. The prototypes flew supersonically without afterburner, vectored engine thrust to improve maneuverability and launched Advanced Medium Range Air-to-Air Missiles and Sidewinder missiles.

The aircraft will be designated the F-22 Lightning II, named after Lockheed's P-38 Lightning of World War II fame. Nine single-seat, two two-seat and two ground-test aircraft will be produced during full-scale development. First flight of full-scale development aircraft is scheduled in 1995.

"The F-22 win is terrific and very strategic for GD," Chairman and Chief Executive Officer Bill Anders said. "It guarantees GD will be in the fighter business well into the next century. It will result in more good jobs at GD."

The Air Force plans to buy up to 750 F-22s. A go-ahead for low-rate initial production is scheduled for 1996. Lockheed will serve as prime contractor. Boeing will handle wing and aft fuselage production, various aspects of avionics development and testing, and systems training support.

The following story details General Dynamics' work on the F-22 at Fort Worth Division.

o o o

Fort Worth Division played a special role in the Advanced Tactical Fighter demonstration/validation program as supplier and integrator of the YF-22 flight controls.

While all parts of the aircraft were essential, the computer-based flight controls were key to success in what has been called the most aggressive flight-test program in aviation history.

The Fort Worth-developed flight controls operated almost flawlessly throughout the three months of testing—a record practically unheard of for such a new and advanced system.

"The flight control system allowed us to go fly the airplane at a high rate and really work on the performance testing... and click off all of the things we wanted to demonstrate," said Kent Clark, Fort Worth's manager of YF-22 flight controls.

"If the flight control system wasn't ready you didn't fly... and if you didn't fly you lost the program," Clark said.

The Lockheed-General Dynamics-Boeing prototypes met all their test objectives and also launched two missiles, even though that wasn't required in the Air Force evaluation.

The flight control development program began in 1987 and involved about 60 employees at its peak. Clark said the team participated in early design deci-



A view of the rear of the YF-22 shows the tail assembly and center fuselage section, which General Dynamics will build for the F-22 Lightning II.

sions about the sizes and shapes of control surfaces, the types of control surface actuators to be used and the degree of maneuverability needed for the aircraft.

The team also participated in wind tunnel tests and designed the aircraft's control laws. Clark said control laws are "the mechanism by which we define how the airplane flies—in other words, when the pilot pulls back on the stick, which control surfaces move, and how much."

The control laws are implemented with software in the flight control computers, of which there are four in the YF-22 for system redundancy and safety.

The F-22, like the F-16, is a "fly-by-wire" aircraft with computers that respond to the pilot's control inputs. There is no mechanical linkage between the stick, rudder pedals and control surfaces. The YF-22's flight control computers contain a software program roughly twice as large as the one for the F-16. The computers help the pilot fly the airplane in that they determine the best way to achieve what he asks for, given the flight conditions at the time.

The YF-22 flight control task also included integration of the aircraft's innovative thrust-vectoring propulsion capability, which allows engine thrust to be "aimed" to enhance maneuverability. Thrust vectoring is a distinguishing feature of the YF-22 design.

All the flight control hardware and software was eventually "put together" and tested in Fort Worth's Flight Simulation Facility, Clark said. Failure testing was conducted almost 24 hours a day for two months. From March through November 1990 the laboratory was open 20 hours a day, six days a week, for ATF work. The test program included numerous simulator "flights" by

Fort Worth test pilot Jon Beesley.

Members of the team also supported flight tests at Edwards Air Force Base, Calif., from September through December. This period went remarkably smoothly because of the earlier work.

The test program included the first high angle-of-attack tests ever conducted in which thrust vectoring was integrated with the flight controls. Beesley said the aircraft demonstrated unprecedented controllability at extremely high angles of attack.

Leaders of the team at Fort Worth were Dawn Mills, lead engineer for flight control system tests; Mike Bernens, stability and control lead; Jane Gardner,

software design lead; Jerry Joyce, control law design lead; Tom Cole, software code lead; Bruce Lyle, lead for actuators; Walter Fuchs, lead for electronic components; John Magbuhat, lead for system checkout at Edwards; Bill Yousey, system integration project engineer; and Steve Zimmer, simulator coordinator.

In addition to the flight controls, Fort Worth will be responsible for the F-22's midfuselage section, tail assembly, landing gear, stores management system, and tailored versions of advanced electronic warfare and communications/navigation/identification systems.

Joe Stout



**Getting to know the products.** Chairman and Chief Executive Officer Bill Anders (right) and Executive Vice President-Marine, Land Systems and Services Jim Turner stand alongside Alexandria, an SSN 688-class attack submarine built by Electric Boat Division. Anders and Turner showed their faith in Electric Boat's products and those who make them by joining the crew for the boat's first sea trials and first dive after its launching. The two executives also accompanied Kentucky, a Trident ballistic missile-firing submarine made by Electric Boat, on its first sea trials and dive. Both submarines are scheduled to be commissioned by the Navy this summer.



## New business opportunity: anti-sub Tomahawk

**A recently publicized effort combining the resources of the Undersea Warfare Center and Convair and Electric Boat divisions is one example of how General Dynamics is seeking opportunities in an environment of declining defense budgets and fewer new programs.**

**T**he initiative offers a weapon that fills a Navy void for an all-weather, long-range submarine hunter-killer. Called Tomahawk Anti-submarine warfare Capable Missile (TACM), the program would provide new versions of Tomahawk cruise missiles that can search, locate and destroy submarines out to several hundred miles.

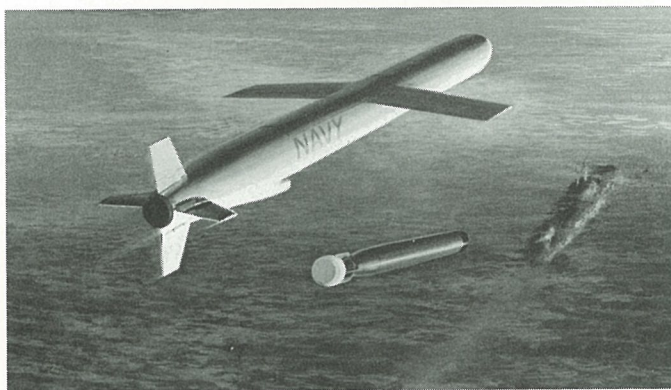
"This program is a good example of why the Undersea Warfare Center was created," said Richard Hoglund, staff vice president. "The center was established to come up with advanced concepts for undersea warfare and develop products out of these concepts for the corporation."

In this instance, the Undersea Warfare Center—a group of 24 employees in Washington, D.C.—noted the Navy's need to locate and destroy submarines capable of launching cruise missiles at surface vessels several hundred miles away. Using a cruise missile for this mission allows attack from a variety of platforms in all weather conditions without risking pilots.

To fill this need, the center drew on a concept originated by Convair in the late 1970s called Subhawk, a derivative of Tomahawk designed to drop acoustic sensors into the water, loiter until the sensors locate the submarine, and drop a torpedo to destroy the sub. The Navy chose not to develop Subhawk. However, by 1988 the Undersea Warfare Center recognized that technological

advances and a modification to the derivative's relocalization function make the concept viable for the '90s.

The Undersea Warfare Center combined independent research and development funds and money from the Defense Advanced Research Projects Agency to complete a study that demonstrated the efficacy of the concept. A General Dynamics team made up of Electric Boat and Tomahawk designer Convair supported the effort. Three outside teammates, American Telephone & Telegraph, Magnavox and Hazeltine, help develop the acoustic sensor and signal processing system. The team continues under contract with the Defense Advanced Research Projects Agency and



A drawing depicts a Tomahawk cruise missile dropping a torpedo to destroy a submerged submarine.

has received over \$2 million in contract support with \$4 million more under negotiation.

Although in the works for three years, the Tomhawk derivative didn't become public until General Dynamics exhibited the concept at the Navy League's Sea-Air Space Exposition in Washington, D.C., last March.

The Tomahawk derivative is compatible with current Tomahawk launchers and will include propulsion systems identical to present Tomahawks. The sensor-dispensing system is based on

the munitions-dispensing capabilities of current Tomahawks. Keeping the derivative as close as possible to current Tomahawks, which proved their accuracy and reliability during Operation Desert Storm, minimizes development glitches and saves money, according to John Shilling, director-programs at the Undersea Warfare Center.

Another advantage of the proposed system is that it would provide anti-submarine defense to any Tomahawk-capable surface force, such as a convoy not protected by anti-submarine air cover. Purchase of this Tomahawk derivative could also extend the life of the Tomahawk production line and aid in lowering unit costs of all Tomahawks.

Research on the program is scheduled to continue until September 1993, when the program would be ready for full-scale development, according to Terry Reed, TACM program manager at the Undersea Warfare Center. Program management would then transfer from the center to Convair.

"An anti-submarine version of Tomahawk offers great promise as an effective weapon for the Navy and a good revenue producer for General Dynamics," said John McSweeney, corporate vice president and Convair general manager. "The methods we're using to develop this Tomahawk version illustrate a good way for the company to find business opportunities within the new realities we're facing in the defense industry."

☞ **Dave Lange**

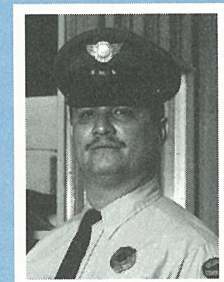
"GD people" is a regular feature. Employees wishing to submit information for possible use should contact their division or subsidiary public affairs offices.



**Pat Gayton**

*Data Systems—Western Center*

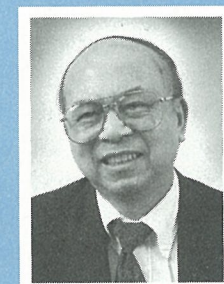
Gayton, a human resources specialist, has been named one of the 100 most promising black women in corporate America by *Ebony* magazine. She fills a variety of roles in her job, including ombudsman, employee newsletter editor, internal communications coordinator, community relations liaison and ride-sharing coordinator. She serves on the employees' Contrib Club board, the board of the International Association of Business Communicators, and advisory committees for United Way and San Diego city schools.



**J.R. Gonzales**

*Fort Worth*

Security Officer Gonzales won the Texas State Security Officers pistol match at Carswell Air Force Base with 586 out of 600 points, just two shy of the all-time state record. He and fellow plant security officer Michael Gaudet previously won a team sharpshooters' event, then finished fourth in the police and security officers' national championship last September. Gonzales has also placed in the expert class of the Texas police pistol shooting championship.



**Francis Loo**

*Electric Boat*

Principal Engineer Loo has been named a Fellow of the American Society of Mechanical Engineers, a worldwide organization of nearly 120,000 members focusing on technical, educational and research issues. Loo specializes in composites, marine propulsion shafting and finite-element stress analysis. He is helping design the composite propeller shafting system for *Los Angeles*-class submarines. Loo joined Electric Boat after 20 years of teaching at Clarkson University.

## Legal delays don't dampen *Seawolf* enthusiasm

*Editor's note: As GD World went to press, a federal judge in Norfolk, Va., issued an injunction May 24 preventing Electric Boat Division from doing any work on the second Seawolf submarine until a lawsuit over the contract goes to trial July 11. On May 29, the court ruled Electric Boat could buy materials for, but could not start construction of, the submarine.*

**E**lectric Boat Division's recent selection to build the Navy's second *Seawolf* submarine capped one of the most hotly contested military contracts in years. Under the terms of the \$614.7 million contract, Electric Boat is scheduled to deliver the 353-foot, 9,137-ton (submerged displacement) SSN-22 in 1997. The division already has under construction SSN-21, the lead ship in a new class that is designed to be faster, quieter,

deeper diving and capable of carrying more weapons than its *Los Angeles*-class predecessor.

"The competition was tough. The competition was formidable. But we prevailed," said Jim Turner, executive vice president-marine, land systems and services. Turner said the award reflected the capabilities and performance of the Electric Boat work force and the division's technological and manufacturing resources.

The award also highlighted the division's successful presentation of economic arguments to Congress and the Pentagon. Presenting these arguments were Turner and key staff members, as well as the leaders of Electric Boat's two biggest unions, the Metal Trades Council and the Marine Draftsmen's Association.

In one crucial hearing before the Senate Appropriations Committee's Defense

Subcommittee, Turner asserted that the award of the second *Seawolf* to Electric Boat would further the development of the most cost-effective acquisition strategy available to the Navy. He went on to explain that substantial cost reductions will result from the knowledge and experience gained on the first *Seawolf* and the Trident submarine program. Trident is recognized as one of the Pentagon's most successful acquisition programs.

The award ended a lengthy period of uncertainty for Electric Boat employees. Turner, however, reminded employees that the overall submarine-construction market will shrink over the next few years, and Electric Boat's work force with it. He referred specifically to a recently announced restructuring program that will cut costs significantly while improving the division's ability to compete in a smaller marketplace. ☞ **Dan Barrett**



# Scranton puts pride into parts for M1 tanks

**M1A1 Abrams tanks, manned by highly trained crews, routed the best Soviet-built tanks fielded by Iraq in Operation Desert Storm. Of 1,956 M1A1s in the theater of operations, none were destroyed, four were disabled and four were damaged, but repairable. At least seven Abrams tank crews reported taking direct hits from the 125mm main guns of Iraqi T-72 tanks and suffered no damage. The shells simply bounced off the M1A1s.**

**M**any people deserve credit for that performance, not the least of which are Land Systems Division's Scranton Plant employees in Eynon, Pa. Nearly 10,000 vendors provide more than 20,000 different parts to be assembled into each M1A1 Abrams main battle tank.

The 500 Scranton Plant employees are vital to that effort. Without parts that make up the tank's suspension system, commander's weapon station, gunner's primary sight, turret race ring assembly and many smaller machined components that these skilled craftsmen provide, the Abrams tank could be an also-ran. Instead, it is widely recognized as the standard by which all other tanks are measured.

The Scranton Plant is a small facility that has been in operation since 1957, when it operated as a "satellite unit" of Chrysler Tank Plant (Detroit Arsenal Tank Plant). Scranton employees have machined parts for M60 and M1 tanks. "We operate much like a family business," says George Stathopoulos, plant manager. "Everybody shares a sense of

pride in our contribution to the world's best tanks."

The plant has approximately 225,000 square feet of low-cost manufacturing and office space and a 50,000-square-foot warehouse—small by most division standards, but critically important to tank production. Manufacturing equipment consists of about 275 heavy and light industrial machines, many of which are highly sophisticated and controlled numerically by computer.

"Our manufacturing technologies give us the competitive edge," says Stathopoulos. "The old torsion bar line is gone, replaced by a modern, high-tech system. Conventional machines have been upgraded and operations have been combined. Grinders have been replaced by automatic lathes that produce the required microfinish. A state-of-the-art, automatic salt bath facility heat-treats torsion bars in the most precise, consistent and complete manner possible."

Howard Harvey, an 18-year employee and resident expert on the salt bath, maintains a delicate balance on each of the system's 17 stations, checking each for salt and moisture content, sodium oxide percentages and a host of other checklist items.

Pride of craftsmanship is best reflected in performance. The customer requires that torsion bars have a life span of 45,000 cycles before experiencing fatigue failure. A bar recently produced at Scranton ran for 154,248 cycles, more than three times the requirement.

Scranton has already received the highest certification—"Class A"—as a



William Wagner, a computer numerical control machinist, loads raw aluminum hubs for machining into parts for M1A1 tanks at Scranton Plant.

user of manufacturing resource planning, an approach stressing effective use of all resources needed for production. A private firm specializing in manufacturing resource planning makes the award. Scranton also records employee labor on an advanced data collection system.

Additionally, by using statistical process control the plant has reduced defects to the point of qualifying for the government's Contractor Performance Certification program. The program recognizes contractors who consistently deliver quality products, control their processes, employ aggressive audit procedures and demonstrate continuous improvement. Certification reduces the government's in-plant quality assurance

involvement in day-to-day activities. "Imagine: The U.S. government will accept tank components if the Scranton employees say they are quality parts," Stathopoulos says. "What an accomplishment."

Scranton employees have watched their facility grow from machining armor to machining armor and aluminum. They know they can satisfy a wide variety of customer needs. "We have the technical knowledge and the demonstrated capability to deliver quality parts on time and within budget," Stathopoulos says. "Our motto is PRIDE—people, resources, initiative, dedication and excellence."

☛ Donald Gilleland

## Scranton: a small plant with a big job

Stanley Chmielewski took a position at the new Scranton Defense Plant on the promise of 18 months' work.

Thirty-four years later, he's still on the job.

Chmielewski, a computer numerical control machinist, was told he would help manufacture parts for 900 tanks during his 18-month tour. Thirty-four years later, Chmielewski is one of 500 Land Systems Division employees who machine thousands of tank components at the Scranton Plant.

Chmielewski personifies Scranton Plant's history as a small facility with a big job. That history began 40 years ago when Scranton Plant first put down roots 115 miles south of its present location. Home in those days was Newark, Del.

In the early 1950s, Chrysler Corp. built and operated a production facility for M48 tanks in Newark. After the Korean conflict, Chrysler converted the plant to automobile assembly. Chrysler modified tanks in an adjacent government-owned facility commonly known as the Lenape Ordnance Modification Center.

In early 1957, production of M60 tanks required a machining and assembly facility near the East Coast. So, the Scranton Defense Plant was constructed on five acres of land in Eynon, Pa. Chrysler leased the facility in 1960 and operated it as a "satellite unit" of the Chrysler Tank Plant in Detroit when the government moved its tank assembly operations from Newark to Detroit.

The Scranton Plant supplied heavy-machined parts to support M60 assembly operations at Detroit Arsenal Tank Plant until May 1979. Then Scranton Plant's mission was expanded to include machining of parts to support M1 tank assembly operations at the Lima (Ohio) Army Tank Plant.

Chmielewski was one of the first employees at the Scranton Plant in 1957. However, he found a building that was not yet complete and heat-treating furnaces that stood in the open air. Raw tank parts were loaded into machines by having several employees pick up the heavy parts by hand, or by using a fork truck and cable slings.

In the early days, Chmielewski worked on the torsion bar line, using lathes

and grinding machines to build top-quality products. He also served more than 20 years as a committeeman for the United Auto Workers, Local 1193, working with other leaders of labor and management to convince the Department of Defense that the Scranton Plant's quality parts were, and still are, essential for national defense.

On July 1, 1980, the Chrysler Defense Division became a wholly owned subsidiary of Chrysler Corp. under the name of Chrysler Defense, Inc. In March 1982, General Dynamics purchased Chrysler Defense, Inc., and established Land Systems Division.

Today, Scranton Plant employees practically glow when they talk about the Abrams tank. Howard Harvey, resident expert on a state-of-the-art, automatic salt bath facility used to heat-treat torsion bars, says he was filled with pride when he watched television coverage of M1A1s in Operation Desert Storm.

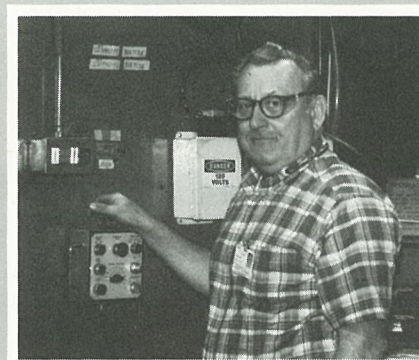
"It made my heart beat faster and brought goose bumps to my arms as I watched 'my tanks' performing exactly as they were supposed to," Harvey says. "I knew that the tank crews would be safe from injury because of the work we do in the Scranton Plant."

Scranton Plant employees also make components for the Korean tank program, as well as armored vehicle spare parts for field operations in the United States and other parts of the world.

"My 18 months of work turned into a 34-year career," Chmielewski says. "Every time I hear another story about how well the Abrams tanks performed in the Gulf war, I feel good about the work we do here."

A small plant with a big job. That sums up Scranton's 34-year history.

☛ Donald Gilleland



Stanley Chmielewski



# The big 'E' It stands for ergonomics—and health

**A**l Stein admits he was skeptical when he first heard about ergonomics, a common-sense approach to creating a healthier work environment and improving workplace processes. Now his enthusiasm is unrestrained.

Stein is a member of the Corporate Ergonomics Working Group, which General Dynamics formed last year to exchange ideas among the company's divisions and subsidiaries.

"I'm from the old school," says the chief manufacturing engineer at Air Defense Systems Division. "We used to build a workplace and put people in it. Now management is modifying the area for the people, feeling a healthy work area reduces stress and increases productivity."

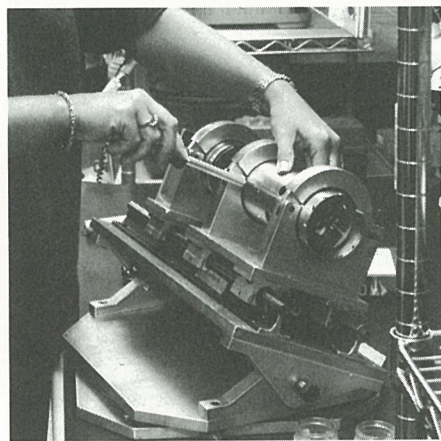
Studies conclude that 48 percent of occupational illnesses are cumulative trauma disorders caused by continuous repetitive motions. Ergonomics helps prevent some of the maladies.

"We feel pleased with the progress of our ergonomics initiative," says Bill Persky, corporate director of safety and health. "Everyone benefits from the success of the division projects."

Air Defense Systems successfully started about 150 corrective actions last year, dropping the division's ergonomics-related problems significantly, Stein says.

"Before, people suffered chronic injuries and didn't realize the cause," Stein says. "Studies now tell us that continuous improper motions can cause those injuries, whether it be on the job or at home."

Hundreds of other ergonomic improvements have begun at company facilities. Most are quick, inexpensive cures. Some are described below.



**AIR DEFENSE SYSTEMS:** Operators at a missile simulator assembly operation stuff electrical components into an aluminum shell, then mate the various components. The old procedure required awkward shifting of the body, Stein said. By modifying the assembly fixture to rotate 360 degrees and tilt 30 degrees, the operator performs the task in a safer, more comfortable position.

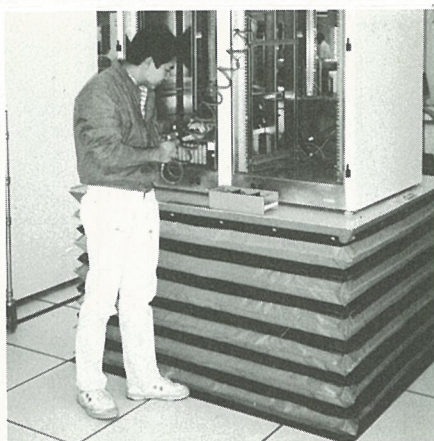
**CESSNA:** Sheet metal assemblers have welcomed the addition of an "industrial chair," which relieves spine, neck and shoulder stress. Workers previously used "creepers," resembling a skateboard, to slide under the body of aircraft. However, there was no support for the shoulders, head or neck. "The in-

dustrial chair gives total body support," says Dave Cooper, safety manager at Cessna. "Workers often missed time, complaining of neck and shoulder soreness. Those complaints have virtually disappeared with use of the industrial chair."

**CONVAIR:** Simple adjustments of lighting, keyboard and video display terminal heights alleviated some problems, says Brenda Kuetzing, senior safety engineer. Convair positioned terminals between, rather than under, overhead lighting to reduce glare and eye strain. Constant work at terminals and typewriters also produced wrist and lower back strain. Some employees who raised their chairs to alleviate the wrist strain were stretching their legs to reach the floor. Adding a footrest reduced potential back problems.

**ELECTRIC BOAT:** At Groton, Conn., a management-union committee is developing guidelines for purchasing video display terminals and equipment. A practical guide for proper use of the terminals has also been drafted.

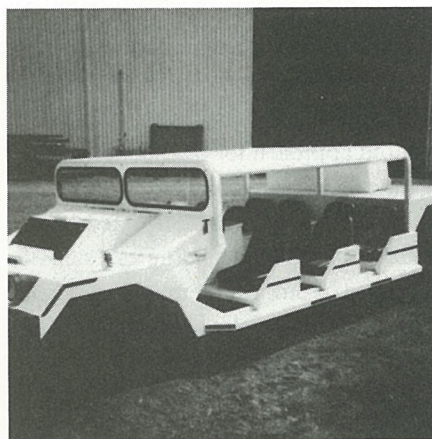
At the Quonset Point Facility, daily stretching exercises at several production departments reduced back injuries, according to Dave Crowell, chief-safety and health. "The daily back-stretching program enhanced awareness of doing a physical job," he says.



**ELECTRONICS:** Adjustable work platforms in the tactical systems operation raise and lower test equipment cabinets during assembly, enabling workers to operate at comfortable levels. This eliminates the need for employees to be on their knees while working on the lower portions of the cabinet, says Ed Langmaid, safety manager.

**FORT WORTH:** Installation of a special lifting device has significantly cut shoulder and neck strains from braiding wires in F-16 electronic wire harnesses. The device supports the harnesses, which weigh up to 25 pounds. Previously workers lifted the harnesses manually for up to five minutes while wrapping them on the braiding machine. Pads were added to the machine tops for cushioned support of operators' arms.

The Abilene Facility in Abilene, Texas, has phased in hydraulic workstation lifts that can raise or lower F-16 pylons about a foot. "It works just like a barber's chair," says Kirk Krienke, safety administrator.

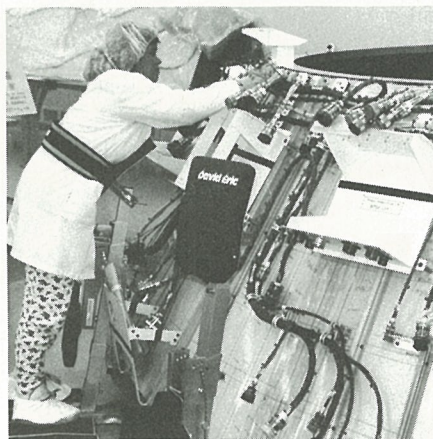


**FREEMAN UNITED COAL:** The design of older underground equipment did not sufficiently consider people, according to Tom Austin, safety director. Freeman has purchased new vehicles with back rests, cushions and seat belts. The result has increased comfort and reduced back and neck injuries.

**LAND SYSTEMS:** Back, shoulder and arm muscle injuries have been eliminated at gear shapers in the Scranton Plant in Eynon, Pa., since employees began using a vacuum to remove metal chips. The chips had been manually shoveled, says Dave Filson, senior health and safety representative.

Potential back injuries were also reduced where spindles are loaded on hobbing machines. Workers excessively strained their backs by reaching up to 3 feet to load 36-pound spindles. Installing a fixture that allows the operator to slide the spindle into the machine solved the problem.

**MATERIAL SERVICE:** Training and hands-on demonstrations on how to adjust workstations help "customize" employees' work environment. "Sometimes people just need to be shown what they can do with the equipment they have," says Randy Mucha, senior safety engineer. "It might involve moving the computer terminal to a comfortable level relative to a person's normal line of vision with glasses on or closing the blinds to reduce glare."



**SPACE SYSTEMS:** The purchase of ergonomic work stands at the Western Test Range at Vandenberg Air Force Base, Calif., has virtually eliminated back strains by workers in clean-room operations, according to George LaCombe, senior safety engineer. The stands allow workers to stretch over equipment safely and with proper support. **Myron Holtzman**

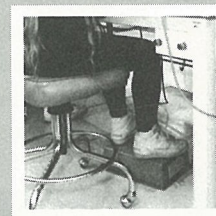
## Simple changes now reduce injuries later

Repetitive motion disorders, otherwise known as cumulative trauma disorders, are caused by using the same movements for a long time. These injuries, such as tennis elbow, have been around for years.

"People need to be aware that these conditions can develop as a result of activities that we perform at work or at home," says Dr. E. Fisher Coil, medical director at Convair Division. "Simple changes in the way we do everyday tasks can have a positive effect on how our back, neck or shoulders feel at the end of the day."

Simple adjustments that employees can perform include:

- Neutralize the arm position by raising or lowering your chair so the elbows are as high as the "home" keyboard row. This allows wrists and lower arms to remain straight.
- Make sure back and thighs are well-supported.
- Put feet flat with upper legs parallel to the floor.



To offer ideas or for more information on how to improve your work environment, contact your supervisor or your facility safety department.

**Myron Holtzman**

### GD WORLD

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**Editor:** Dave Lange, corporate manager-internal communications

**Designer:** Bruce McIntosh, corporate graphics administrator

**Contributors:** Julie Andrews, Dan Barrett, Pete Connolly, Graham Gävert, Donald Gilleland, Myron Holtzman, Dean Humphrey, Jerry Littman, George Livesay, Pat Moritz, Karl Oskoian, Jack Price, George Salamon, Chris Schildz, Eric Solander, Peter Stamos, Joe Stout



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# First six months bring successes for GD

(continued from page 1)

business accordingly, and perform to the best of our ability.

Our commercial business is profitable, well-positioned and growing. Part of our strategy is to more fully develop our opportunities in this sector. Though our mainline business is defense, I expect that our commercial businesses, which already contribute 14 percent of our total sales, will continue to grow.

The strategy in the defense sector is necessarily more complex. Barring some unforeseen event, defense spending in the United States and abroad will continue its sharp contraction. This view is shared by many senior military, defense and Congressional leaders. Current overcapacity in the industry will worsen and competition will toughen. The painful downsizing that had to start in earnest with the cancellation of the A-12 will necessarily continue as we strive to enhance our competitive position in a declining market. In short, as our market shrinks, we should plan to shrink as well. But it is by no means a given that we will shrink as drastically as the market. Indeed we recently obtained a significant amount of profitable new business above our conservative planning base. Now it appears that our backlog at year end will be about the same as it was last year. This means that the company will not have to reduce its work force to earlier projected levels.

As competition intensifies, we must become more productive and more profitable—difficult but doable feats in a shrinking market. This not only means working harder, it also means finding ways to work smarter by ridding ourselves of unnecessary bureaucracy and procedures and being more efficient. At the same time we must strive to con-

tinuously improve our products and customer service.

The decline in defense spending also translates into less spending on facilities and equipment and suggests a more focused approach for our spending on research and development.

Some people have interpreted our cutback in capital spending as a sign of wavering in our long-term commitment to being a major defense contractor. This is just not true. The fact is that over the past five years we spent over \$2 billion on new capital. Now, as the industry contracts, we have more modern plant and state-of-the-art equipment than necessary. We simply do not need to maintain our capital spending at its recent high levels.

A lower defense budget also means fewer new programs. We are, therefore, redirecting our R&D spending to those specific opportunities that offer the best prospects for profitable sales. We are continuing to increase our customer-funded R&D so that our total R&D (less that of A-12) is about the same as last year. The mix may have changed but our dedication to laying the technical base for good business opportunities has not.

To summarize, our strategy is to—

- Continue our dedication to fair dealings, superior design, quality and customer satisfaction;
- Match our business plans to realistic

market projections;

- Reduce our capital spending and other working capital;
- More sharply focus our R&D investments and strive for more contract R&D;
- Improve our productivity to enhance our competitive position;
- Improve our profitability and generate cash so that the company can take advantage of new opportunities ahead.

If condensing our strategy to several brief statements makes it appear simple, it is anything but that. Successful implementation will require nothing less than a change in our culture. The characteristics of our business have changed so dramatically that the way of doing business that was very successful in the mid-1980s will no longer work.

Changing a corporation's culture is not an easy task; and to do it quickly, as we must, is especially challenging. That is why the board of directors and our shareholders approved sweeping changes in our compensation and incentive system. The changes are designed to motivate all of us to make the difficult decisions necessary to adjust rapidly to our new environment and rebuild the company's financial strength so that we will be well-positioned for the challenging future ahead.

The past six months as your chairman have been primarily days of planning, strategizing and implementing. It

is far too early to spend a lot of time reminiscing. But, I am happy to report we have had some early successes—

- The first quarter produced solid operating results as we met our operating plan goal for earnings and achieved better-than-planned cash flow.
- We won significant new work from each of our three major U.S. customers, the Army, Navy and Air Force, and from a major foreign customer.

Our efforts have been watched and acknowledged. The market value of our stock has increased significantly. So has GD's SSIP stock fund for employee-shareholders, which has increased by more than 50 percent, or about \$55 million.

In conclusion, while much hard work remains, I am pleased with what has been accomplished. We have thoroughly assessed our commercial and government markets and have devised a challenging but realistic strategy for prospering in these markets. The early results are favorable and provide real hope for the future. We must strive to increase our strengths and continue these favorable trends in order to ensure that General Dynamics will be a premier company for shareholders, employees and customers. Sincerely,



William A. Anders  
Chairman and Chief Executive Officer

## SSIP changes

(continued from page 1)

seeing considerable benefits. The market value of General Dynamics stock has risen more than 50 percent since Dec. 31.

Now all employees who are shareholders have the opportunity to directly impact the value of their own stock investment.

Cessna's Fred Bright and Air Defense Systems' Shirley Wilson put those thoughts in their own words.

"I've participated in the SSIP program since its inception here," says Bright, director-employee development and participation. "I'm keenly aware that when GD's stock price goes up, I benefit. And as the person who is responsible for all training at Cessna, it strikes me that there's a very direct connection between the work each of us does and strengthening the company. Giving our people the right training to improve their skills leads directly to greater efficiency and contributes to both the bottom line and shareholder value."

Adds Wilson, who works in the product assurance department and is a Total Quality Management Task Force member: "When I look at the 'big picture,' I realize that each one of us can affect shareholder value and improved SSIP balances. When we do a good job, the results show up in our departments, divisions and the corporation by way of high quality, low cost and competitive products. As a result, the company then becomes a more viable investment,



YF-22 CONTRACTOR TEAM



F-22 Advanced Tactical Fighter (left) and a Cessna business jet

which increases shareholder value and ultimately the employee-shareholder SSIP balances."

Employee-shareholders also derive the basic benefits of stock that make it attractive to all investors. Those hesitating to invest in stock because of its perceived risk should remember:

- Stocks have historically outperformed fixed-income investments. For the 60-year period from 1926-85—even with the stock market crash of 1929 and the subsequent Depression—the rates of return from stocks have averaged about 5 percent more per year than from long-term corporate bonds and about 5 3/4 percent more per year than from savings accounts and long-term government bonds.

"Our stock could be the best profit-sharing plan going," says Chairman and Chief Executive Officer Bill Anders, "if the stock price continues to go up. Indeed, our employees have already benefited from our recent successes, which they've made possible through their hard work and outstanding performance."

## Stock primer

(continued from page 2)

amine criteria other than the p/e ratio.

Return on shareholders' equity measures the profits a company makes as a percentage of the capital put up by shareholders. In recent years, about 15 percent has been the average for major corporations. A 20 percent return has been considered quite good.

Return on equity, which is measured by dividing a year's net earnings by the shareholders' equity, averaged out at about 18 percent at GD in the second half of the 1980s, above average among 10 major aerospace companies.

Financial experts will point out that in "real life" the arithmetic is a little more complicated. In practice, shareholders' equity includes not just the money originally paid by shareholders for their shares when issued by the company. It also includes company funds reinvested in the business annually.

We'll look at some other ways of measuring the company's profits—and how these measurements show General Dynamics' need to improve—in future issues.

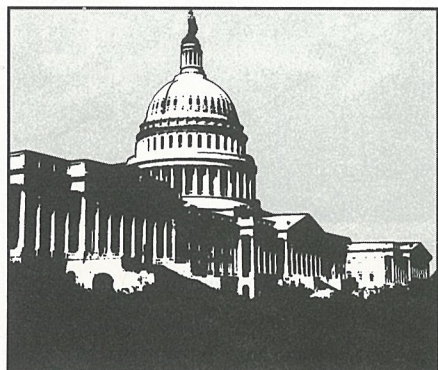
☛ George Salamon



# GDWorld

Published for employees of General Dynamics Corporation

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## Business groups to shoulder some operational tasks

Moving the corporate office is just one of several developments under way as our company evolves its strategy to operate effectively in our industry's new environment of shrinking Department of Defense budgets.

Central to our cultural change and strategic direction is the reorganization of General Dynamics into six business groups comprising our divisions and subsidiaries. These groups are aircraft programs; Missiles and Electronics; Marine, Land Systems and Services; Space Systems; Resources; and Cessna Aircraft Co. The business groups are being given broader scope in running their operations, as well as increased accountability for their financial performance.

The divisions and subsidiaries within the business groups will have direct profit and loss responsibility for their operations. The programs and program managers within the divisions and subsidiaries are being remodeled into business areas and business area managers. The business area managers will serve as "owners" of their business areas and will be more responsible and accountable for their business areas' success.

The corporate office is devoting more attention to setting and implementing corporate strategy with a sharper focus on strengthening General Dynamics' financial health. But this does not mean that the corporate office will keep "hands off" the business groups. The corporate office will continue to have selective oversight in the financial, technical and programmatic side of operations.

Among other things, the corporate office will have increased emphasis on:

- setting operating policies and the broad strategic framework under

(continued on page 2)

## Corporate Office relocation reflects strategy to respond to emerging national policy

The U.S. government will have a new neighbor later this year: General Dynamics.

**O**ur corporate office is moving from St. Louis to Falls Church, Va., 10 miles outside Washington, D.C., to put our company near the ongoing debate to establish a new national security policy.

"We want to be closer to these important deliberations in order to better understand how we might best match GD's business strategy with our country's changing defense strategy," says Chairman and Chief Executive Officer Bill Anders. "This is important in positioning our company for a successful future in the defense industry's new environment."

It's generally recognized that the downturn in defense spending is likely to be permanent. That means our principal customer will be able to afford fewer kinds and quantities of equipment and systems than it bought in previous years when defense budgets were larger.

The headquarters relocation also signals the start of a new era in the corporate office's relationship to the rest of our company. "The corporate office role is gradually changing from an operating office to more of a strategic office," Anders says. "Our culture is reflected in the way we do business, so this change in the corporate office's role represents a part of an important and necessary change in General Dynamics' culture for the new and different challenges ahead."

However, this shift in the corporate office's relationship is not cut and dried. Our new northern Virginia headquarters will retain a great many operational responsibilities. But our newly created business groups (see story in left-hand column on this page) and their member operating units are receiving more authority—and accountability—to plan and execute their activities.

This change will not take place overnight. In fact, the structure and roles of the business groups have been evolving for almost a year and will not be finalized for some time.

"We're leaving some of our past practices, procedures and culture behind in St. Louis, not because they're wrong, but because they no longer are a good fit with our new business environment or direction," Anders says.

In this environment, executives in the business groups and operating units will run their areas of responsibility with a greater degree of freedom than in the past. However, they will also enjoy a higher level of accountability to our corporate office for meeting specific operating and financial goals.

Though there will still be corporate involvement and oversight in the technical and programmatic side of our operations, increasing our focus on financial returns and financial goals at the operating group level is necessary and demands a higher priority than it has in past years. In addition, it broadens the perspective of operating management and requires them to view their business and measure their performance with a broader set of standards demanded by our new environment. For that reason, our 150-member senior management group is undergoing an intensive week-long refresher course at the Executive Education Center of Northwestern University's renowned J.L. Kellogg School of Business. The objective of this course is to improve their understanding of the business skills needed in this way of managing our operations.

The timing of the Northwestern program is particularly appropriate as our management team guides our company through a challenging period. Decisions on difficult business issues will be required.

Being closer to the national policy debate proved to be the decisive factor in one difficult decision: moving the corporate office. And while no one can say with certainty what the future holds, one thing is for sure: Many more challenges and important decisions lie ahead.



This building in Falls Church, Va., will be the new home of the Corporate Office. The Corporate Office move will be completed late this year.

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Twenty years ago, the company had a new chief executive officer and a new Corporate Office. Sound familiar?

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Fort Worth's Bill Dietz has been one of the guiding forces behind almost every company aircraft design since 1941.

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Fox vehicles take the worry out of being close to nuclear, biological and chemical contaminants.

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The Cold War may be over, but sensitive information must be safeguarded as closely as ever.

#### Magnetic attraction 8

Building huge magnets for the Superconducting Super Collider is good business for General Dynamics.

## GD has strong second-quarter, first-half gains

General Dynamics posted a strong second quarter and first half of the year, reporting earnings of \$211 million for the quarter and \$268 million for the first half. In 1990, the company lost \$240 million in the second quarter and \$116 million in the first half.

Earnings per share were \$5.04 for the second quarter of 1991 and \$6.41 for the first half.

Second-quarter net earnings included a gain of \$140 million or \$3.35 per share from an adjustment to the company's tax provision. Without the gain, net earnings were \$71 million, or \$1.69 per share, on sales of \$2.4 billion.

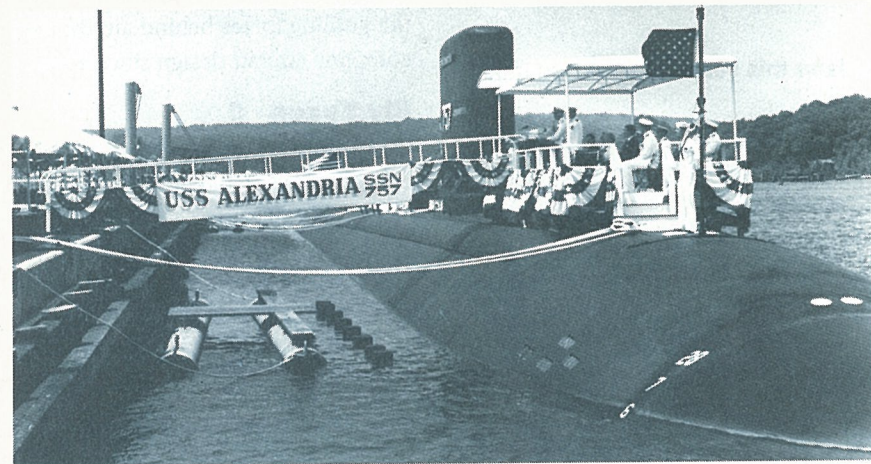
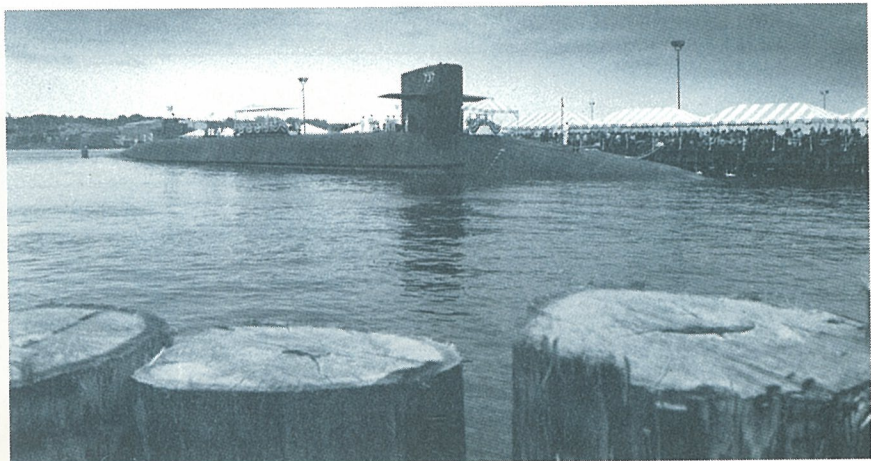
"The strong operating performance in the second quarter reflects continued success in implementing our new strategy put in place earlier this year," says Chairman and Chief Executive Officer Bill Anders. "We made progress toward each of our goals: reducing risk in our business; stabilizing and then improving profitability; and building financial strength to be a strong competitor for the future."

Meanwhile, declining expenditures on research and development reflect the company's more focused effort toward technology development.

(continued on page 2)



Navy's newest 'Electric Boats' enter the submarine fleet



The Navy recently commissioned two Electric Boat-built submarines into the fleet, the USS Kentucky (top) and the USS Alexandria. The Kentucky is a Trident ballistic missile-firing submarine. The Alexandria is a Los Angeles-class attack submarine.

JIMMY BRENNAN PHOTOS

C-130 gets early-warning gear

Fort Worth Division has installed a Navy E-2C Hawkeye Airborne Early Warning Radar System into a long-range C-130 Hercules airframe to provide extended patrol capability for the U.S. Coast Guard. The aircraft is undergoing flight testing at the Naval Air Test Center, Naval Air Station Patuxent River, Md. The installation is the first of its kind and enables the Coast Guard to conduct a 10-hour surveillance mission with increased crew comfort and efficiency. The airplane has been designated the EC-130V.

General Dynamics' design minimizes the aircraft structural modifications required to support a standard E-2C pylon and rotodome. The three radar operators' positions are mounted on a pallet to allow easy aircraft maintenance and reconfiguration.

Fort Worth completed the design and modifications in 18 months under a contract that also includes aircraft flight and maintenance manuals, training



The EC-130V modified with the Hawkeye radar system makes its first flight July 31. The rotodome mounted atop the fuselage by Fort Worth Division is the major external modification to the aircraft.

related to the minor differences in the aircraft and weapon systems, and a spares package. The EC-130V features relatively low modification and operating costs, long endurance, and commonality with the E-2C Hawkeye system and C-130 airframe.

Business groups

(continued from page 1)

which the groups and operating units will operate.

- monitoring the strategies and performance of the operating groups against identified objectives.
- allocating capital and other resources among the operating groups based on the best opportunities to generate attractive returns.
- working with each business area to identify and address critical issues that will affect its growth and/or generation of acceptable returns.

The process by which this new approach is being adopted is through annual strategic and operating "business reviews" and monthly and quarterly "dollar days." The entire corporate office team of top executives meets with the groups, divisions and subsidiaries at the annual reviews. During "dollar days," President and Chief Operating Officer Jim Mellor examines financial and operating performance with business group management.

The restructuring began a year ago and is expected to continue until about the end of 1992. Where do we stand?

Naming leaders of the six business groups finished recently when Gordon England was named executive vice president-aircraft programs. England, who had been vice president and general manager of Land Systems Division, will head Fort Worth and four business areas: F-16 fighter, F-22 advanced tactical fighter, military electronics, and special programs and other businesses.

England replaces Vice Chairman Herb Rogers, who has retired after 42 years with General Dynamics.

Two other business group heads were named in the last few months. Mike Keel was appointed executive vice president-missiles and electronics and

oversees Air Defense Systems, Convair and Electronics divisions from his San Diego office. Jim Turner was designated executive vice president-marine, land systems and services and is responsible for Land Systems and Electric Boat divisions, General Dynamics Services Co., the Undersea Warfare Center and American Overseas Marine Corp. from his base in Washington, D.C.

Executive Vice President Lester Crown continues as head of Material Service Corp., Freeman United Coal Mining Co. and Marblehead Lime Co. in Chicago. Executive Vice President Russ Meyer leads Cessna Aircraft Co. in Wichita, Kan.

Mike Wynne heads Space Systems as it transitions to operating group status.

Where do we go from here?

- The Executive Council, which comprises the top management of the company, is defining how the business groups will work with their subordinate operating units on a day-to-day basis.
- Corporate policies and procedures are being completed that specify the balance of authority and responsibility to be delegated to the business groups.
- The divisions and subsidiaries will change from program management to business area management. Under this structure, the general manager will provide site support such as procurement, selected manufacturing and assembly, human resources, finance, legal and communications services to the business areas. The business area manager will be responsible for other aspects of that particular business area, including some elements such as capital investment that had previously been under the authority of the general manager.

Future issues of GDWorld will detail the reorganization as it progresses.

Earnings

(continued from page 1)

"We have to increase our customer-sponsored research and development while concentrating company R&D on projects with potential for high returns and proprietary advantages," Anders says. "We believe this will enable us to reduce short-term spending without forgoing longer-term opportunities."

Military Aircraft profits reflected receipt of the final \$10 million pretax license payment from Mitsubishi Heavy Industries for the Japanese FS-X program. Cessna Aircraft reported increased sales

and profits over the period a year ago.

Second-quarter events included award of the second Seawolf submarine to Electric Boat Division. A U.S. District Court has ordered the Navy to resolicit the contract. It is expected this decision will be appealed.

Final agreement was also reached and initial funding awarded for full-scale development of the F-16A/B Mid-Life Update program at Fort Worth. This five-nation program could ultimately be valued at about \$2 billion.

SSIP				
Annual rate of return for the 12-month period ending:	May 1989	May 1990	May 1991	
Salaried				
Government bonds .....	8.1%	8.3%	10.7%	
Diversified portfolio .....	29.9%	15.8%	9.7%	
Fixed income .....	10.5%	10.2%	9.9%	
Hourly				
Government bonds .....	8.3%	8.3%	10.5%	
Diversified portfolio .....	30.5%	15.9%	9.6%	
Fixed income .....	10.5%	10.2%	9.7%	
GD stock closing price:	\$57.37	\$35.50	\$38.37	
Annual rate of return for the 12-month period ending:	June 1989	June 1990	June 1991	
Salaried				
Government bonds .....	8.5%	8.1%	10.0%	
Diversified portfolio .....	21.0%	16.1%	3.9%	
Fixed income .....	10.5%	10.2%	9.9%	
Hourly				
Government bonds .....	8.7%	8.2%	9.8%	
Diversified portfolio .....	21.5%	16.3%	3.7%	
Fixed income .....	10.4%	10.2%	9.6%	
GD stock closing price:	\$58.25	\$32.00	\$41.87	



# A tale of two relocations

**T**hose subscribing to the theory that history repeats itself will find very few parallels to the relocation of our corporate office and a similar event 20 years ago.

It was in 1971 that we moved our headquarters from New York to St. Louis.

Twenty years ago, the defense industry faced one of its periodic downturns as the United States sought to disengage from the Vietnam War. In those days, what went down eventually went back up, if the "what" was the defense budget. That happened 10 years later, when the Reagan administration took office with a mission to "beef up" the nation's defenses.

The defense budget isn't so predictable anymore. In fact, indications are the current reductions in defense spending may not be reversed for a long time—if at all. This is the "new environment" that GD's new chairman and CEO, Bill Anders, speaks about often in company gatherings and media interviews.

There's another important difference between GD's headquarters relocations of 1971 and '91. The 1971 move symbolized the larger role the corporate office planned to take in division and subsidiary operations. The chairman's letter to shareholders in GD's 1970 annual report summed it up in less than 50 words:

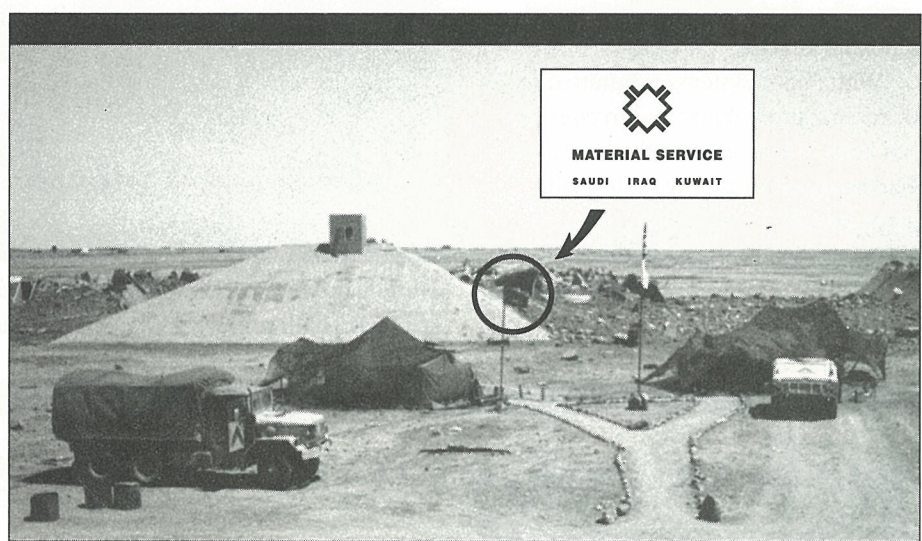
"Our key corporate people will be expected to take an increasingly active part in the management of our operating units, and to facilitate this we have chosen to locate in St. Louis where our headquarters personnel will have rapid and easy access to our major operating sites."

Relocation to Washington in 1991 underscores a shift in management policy. The corporate office is dedicating more effort to the long-term direction of General Dynamics. Being in tune with the governmental debate on national defense policy while closely monitoring the customer's needs are prerequisites to long-term success, so moving to the Department of Defense's hometown puts General Dynamics' management in better touch with the defense environment during the post-Cold War years.

Yes, times are different since General Dynamics transplanted its headquarters in St. Louis 20 years ago. The very phrase "post-Cold War" would have been almost unimaginable. In 1971, nothing short of the threat of a "hot war" seemed sufficient to minimize East-West tensions. But largely because of a vigilant defense policy backed up by weapon systems produced by General Dynamics and other U.S. defense companies, the Cold War seems to have passed without temperatures reaching the boiling point.

Yet some things don't change. The passing of 20 years hasn't altered General Dynamics' goals much, as defined in that 1970 annual report: "Our immediate and principal objectives are to maintain our position as a major government contractor, to improve the earnings contribution of this work, and to build on our previously established base of commercial activities."

Pursuing those objectives served General Dynamics, its customers, employees and shareholders well in the past—and will continue to do so in the future.



**Flagging enthusiasm.** Ron Geske, a Material Service Corp. superintendent who served with the National Guard's 233rd Military Police Company in the Persian Gulf, made a Material Service flag (circled) and flew it over his unit's camp in Iraq.

RON GESKE

## Company to auction some assets

A variety of company-owned assets will be auctioned publicly in San Diego over the next month. The inventory includes various office and manufacturing equipment. The auctions constitute a program to convert non-revenue-producing assets into cash.

Space Systems will participate in one auction Sept. 6. Convair, Electronics and Space Systems will participate Sept. 19. Two auctions were held earlier in Fort Worth and Pomona, Calif.

More information, such as specific items to be offered at each auction, is available from Tara Herron of the auctioning firm, Ross-Dove Co., at (415) 571-7400.

## NEWS BRIEFS

### GD files joint complaint disputing A-12 termination

General Dynamics and McDonnell Douglas, partners on the Navy's A-12 advanced tactical aircraft, have jointly filed a complaint in U.S. Claims Court disputing the government's termination of the program for default. If upheld, the complaint would convert the default termination to termination for convenience of the government and would eliminate the government's claim of \$1.352 billion against the companies.

The complaint asserts that the government eliminated many early risk reduction efforts, including studies and tests, required by law to justify award of a fixed-price development contract; set specifications that it knew were unattainable; failed to provide critical data from other classified programs; interfered with the contractors' ability to execute the contract; and failed to apply available funds to execute the contract as required.

At the time of the A-12 termination Jan. 7, the companies were making satisfactory progress toward the completion of the contract and had successfully concluded the last of three engineering design reviews. The Navy had determined that the aircraft met its operational needs and requirements.

### F-22 contractor team starts next development stage

The Air Force has given the F-22 contractor team of Lockheed, General Dynamics and Boeing the go-ahead for engineering and manufacturing development, the next step in the F-22 program.

Work starts under a \$9.55 billion contract calling for refinement and completion of the F-22's internal and external configuration, continued testing of the YF-22 prototype, start-up of training and support systems, initial tooling, and production of nine single-seat and two tandem-seat aircraft. Two non-flying airframes will be built for static and fatigue testing.

Fabrication of the first engineering and manufacturing development F-22 is set to begin in December 1992. Assembly is scheduled to start in mid-1993 and first flight in mid-1995.

### Special Olympics athletes go airborne on Citations

A total of 195 Cessna Citation business jets recently ferried about 1,400 athletes to the International Special Olympics in St. Paul, Minn. The airlift, organized by Cessna Aircraft Co., carried athletes from 30 cities in 23 states and the District of Columbia to

St. Paul July 19 and returned the participants home July 27. Aircraft were provided by 178 corporations.

### Convair captures bulk of Tomahawk supplement

Convair Division has won 63.4 percent of the Navy's funding for a supplemental buy of Tomahawk cruise missiles to replace those used in Operation Desert Storm.

The Navy recently awarded \$180.7 million to Convair as an add-on to fiscal year 1991 Tomahawk purchases. McDonnell Douglas received the remaining \$104.4 million. Convair will build 208 Tomahawk Block II Sea Launched Cruise Missiles and McDonnell Douglas will produce 70 with the supplemental money.

### Failure report prompts Atlas/Centaur changes

Space Systems Division Atlas/Centaur launch vehicles will undergo additional inspections and procedures following an investigation of the failed launch of an Atlas/Centaur last April.

A General Dynamics failure investigation team reported to an independent Failure Oversight Review Board that there were three possible factors leading to a Centaur engine turbopump seizure that caused the vehicle to tumble out of control and be destroyed by range safety officials. Foreign object damage, low torque at the start of turbine rotation combined with a contaminant, or water, ice or frozen nitrogen in the pump, caused the seizure. The failure was the first for the reliable Pratt & Whitney Centaur engine.

After reviewing these findings, the Oversight Board separately concluded that foreign object damage was the most likely cause.

New inspections based on these findings will search for foreign objects. These findings have also resulted in new engine procedures to increase engine torque margin.

### GMs named at Land Systems, Electric Boat

George Psihas is the new corporate vice president and general manager at Land Systems Division. Roger Tetrault has been appointed to the same position at Electric Boat.

Psihas, 64, had been corporate vice president and general manager of General Dynamics Services Co. He previously had worked at Land Systems and its predecessor, Chrysler Defense, Inc. Tetrault, 49, joins the company after 20 years with Babcock and Wilcox, where he worked with nuclear products for naval vessels.

## GD WORLD

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## Bill Dietz: Fort Worth's first 50-year man

**A**fter a career spanning more than 50 years, countless design programs and numerous first flights, 72-year-old William C. "Bill" Dietz, vice president and senior technical staff member at Fort Worth Division, still gets excited when he sees a new aircraft program taking shape.

He had that feeling recently when the Air Force selected the F-22 as its next-generation air superiority fighter, after one of history's most aggressive and successful flight-test phases.

"That's where the reward is, getting it built and getting it flying," he said.

As in many other programs, Dietz was pressed into service early in the YF-22 prototype effort, contributing to work that blended aspects of the individual Lockheed, General Dynamics and Boeing Advanced Tactical Fighter concepts. Later, he led reviews and other tasks necessary to complete design of the prototype.

To those who know Dietz, there's nothing ironic in Fort Worth's oldest employee—in terms of service length—playing a key role in creating the division's newest aircraft program. Abilities to continually adapt and grow with technological and organizational change have been essential to Dietz's success.

Dietz joined Consolidated Aircraft, a General Dynamics predecessor company, in San Diego in 1940. His initial work was on the PBV Catalina seaplane, followed by the PB2Y, PB4Y, B-24, B-32, B-36, B-58, F-111, F-16 and F-22—naming only the aircraft that progressed to the flying stage.

Although he has been in Fort Worth most of the time since the plant opened in 1942, he returned to Convair for four years in the early 1980s as vice president and program director for cruise missiles, leading development and production phase-in of the Tomahawk.

His accomplishments are impressive, but Dietz accepts little individual credit for innovations his work helped foster. "Nobody does anything single-handedly at a modern aerospace company," he said. "All of our accomplishments have been team efforts with a lot of contributions from different people."

One distinction he does accept, however, is that he was the first employee to reach 50 years of company service at Fort Worth last October.

Dietz said his favorite programs have been the B-58 and F-111 because they pushed the leading edge of technology in their times, and the F-16 "because the Air Force gave us free reign in designing the prototypes. ... It wasn't anything but a demonstration program in the beginning."

Dietz served as chief engineer and engineering director for the F-16 prototype and full-scale development programs from 1971-79.

In his 51st year with the company, Dietz is working on conceptual tasks related to the Navy's anticipated AX aircraft requirement. "I like to work on airplanes because it's interesting and challenging ... and it's too late to change now," he said.

☞ Joe Stout



Bill Dietz poses with models of some of the many aircraft he's worked on during his 50 years with General Dynamics.

TOM HARVEY

## Harlingen's parts help put Atlas/Ce

**When a Space Systems Division Atlas/Centaur rocket leaves a launch pad, it takes a good many pieces of Harlingen, Texas, with it.**

**S**pace Systems' Harlingen facility builds 30 percent of the structural components for the Atlas/Centaur program, as well as the forward and aft adapters for the Titan/Centaur program.

The plant has been a dependable source of parts, and barely missed a beat this spring when heavy rains flooded the facility. (See story below.)

Components produced at Harlingen include thrust structure, pod doors, interstage adapter, equipment module, stub adapter, payload adapter and payload fairing, which are shipped directly to Vandenberg Air Force Base, Calif., or Cape Canaveral, Fla., for final assembly and eventual launch.

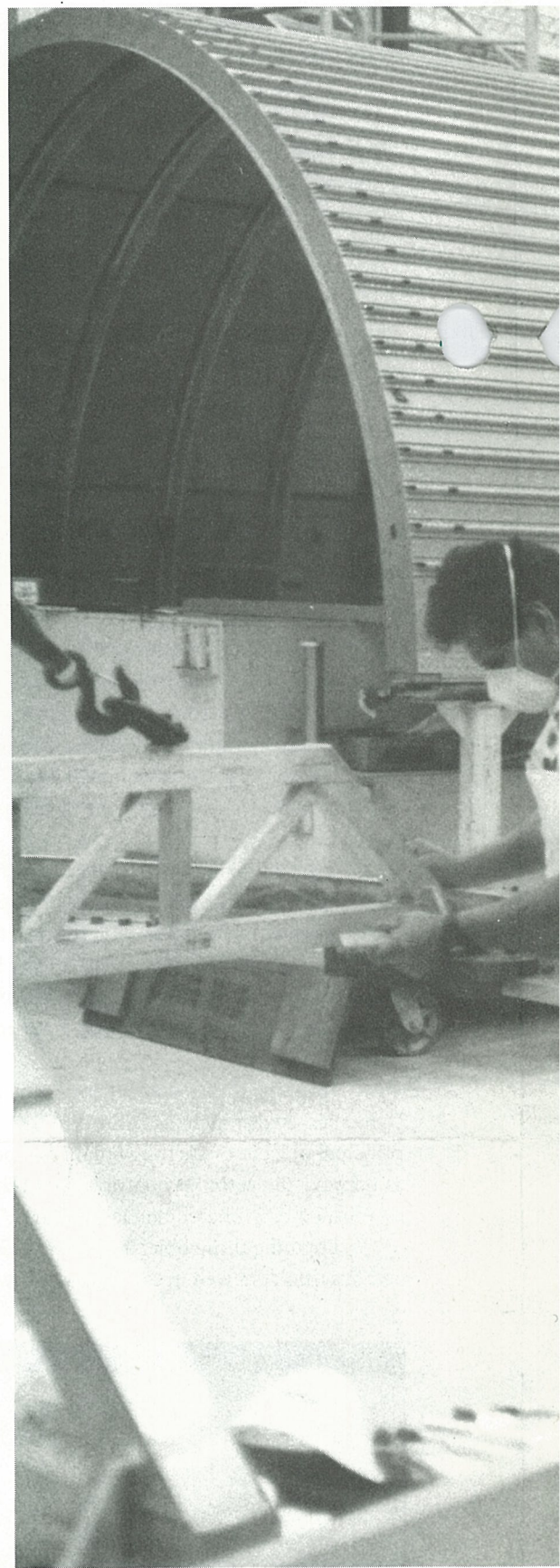
The facility was the first high-tech industry to locate in the low-lying farmlands of the Rio Grande Valley in southern Texas. The majority of the work force was hired and trained locally.

The Harlingen facility was originally opened in 1987 to modify aircraft as part of General Dynamics Services Co. However, the manufacturing facility was transferred to Space Systems in January to concentrate on production and assembly of components for the launch vehicle programs.

"We are in the structural assembly business," said Richard Gibb, director of operations of the Harlingen facility. "We have been in full operation for a relatively short time and are producing quality hardware within our cost and schedule targets."

With Space Systems committed to increasing profitability and to commercial launch services over the long term, Harlingen will play a key role in the more than 60 launches that Space Systems plans over the next decade.

☞ Chris Schildz



Harlingen workers clean equipment shortly after the facility structures built at Harlingen are in the background.

## Harlingen weathers storm, fights off flood, stays on production sched

**T**he storm that poured 17 inches of rain on Space Systems Division's Harlingen, Texas, facility was never supposed to happen, according to local weather predictions.

"It was a flash thunderstorm that even caught the National Weather Service by surprise," said Richard Gibb, director of operations at the Harlingen facility. Knee-high water covered much of the plant's 300,000 square feet of manufacturing space as a result of the April 5 mystery monsoon.

"The bulk of the rain occurred in a 10-hour period and there was no place for all that water to go," Gibb said. "The drainage system for the flat farmland

here in the Rio Grande Valley was simply overwhelmed."

Southern Texas averages 25 inches of rain a year. The improbable cloud-burst over Harlingen severely tested the 463 General Dynamics employees there. Sixty-four employees sustained major damage to their homes or possessions and many were left temporarily homeless. No one was hurt.

Like Electric Boat's Charleston, S.C., facility, which was hit by Hurricane Hugo in September 1989, Harlingen faced a considerable cleanup task. The flood left 1 1/2 inches of mud throughout the plant. But only two production days were lost.

"We are the second-largest employer

in town and it was important to get back into production as quickly as possible," Gibb said. "All of our employees jumped right in and we were also able to temporarily hire 50 unemployed townspeople to help shovel the plant out."

Office equipment was inoperable, but people dried, repaired and put back in operation most of the electric motors in the manufacturing area. Space Systems maintenance personnel from San Diego flew in to help. By Tuesday, April 9, the plant was functioning at about 85 percent capacity and the hardest-hit employees were being assisted by the General Dynamics Recreation Association (GDRA).

"We used GDRA to help 12 families who lost homes, cars and possessions," said Gibb. "We collected \$4,250 and distributed that and donations of furniture and clothing to those families."

"To give you an idea of the team spirit here, several of the families we had identified for assistance turned our donations down. They asked GDRA to give the donations to other families they considered more unfortunate."

Joe Zuniga, a tool crib attendant, headed one of the 12 families that received GDRA assistance. His wife and four children temporarily slept on wooden pallets because bedding was too wet to use. "GDRA made a financial



# /Centaur into space



FRANK JONES

the facility was flooded last spring. Launch vehicle  
nd.

## module

contribution and donated some clothing to me and to others," said Zuniga. "We certainly appreciated the kindness after the flood chased us from our house."

Other employees narrowly escaped disaster. Kathy Sanford, senior human resources representative, remembers water creeping up her driveway while her husband was away at work.

"I had 9-month-old twins and we watched as the water made it all the way to the door," she said. "I was worried because I didn't know what I was going to do to get the kids out. Luckily the water stopped rising, but people were riding up and down the street in boats by noon."



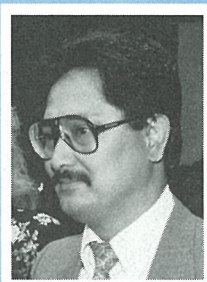
FRANK JONES

All employees pitched in to keep the plant functioning. The accounting department set up picnic tables in the manufacturing area to move paperwork for paychecks.

"I'm tremendously proud of the spirit showed by the work force," Gibb said. "We stood up to the task at hand and there was absolutely no downstream effect on Atlas/Centaur or Titan/Centaur production." **Chris Schildz**

## GD PEOPLE

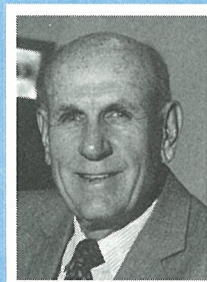
"GD people" is a regular feature. Employees wishing to submit information for possible use should contact their division or subsidiary public affairs offices.



**Ken DelaCruz**

*Electric Boat Division*

DelaCruz, president of the Metal Trades Council, received two awards for bravery during a fatal fire. He rescued an 11-year-old girl and brought out the girl's sister, who could not be revived. Heat and smoke thwarted a third trip into the house. Two other children and their father also died. DelaCruz received the Carnegie Medal and the Connecticut Public Safety Department's Citation for Bravery. His wife, Susan, was also honored for reviving the 11-year-old and trying to revive her sister.



**Walt Hill**

*Fort Worth*

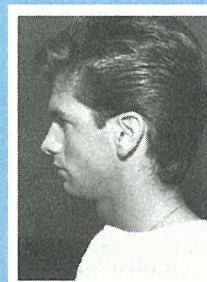
Hill, director of occupational health and safety engineering, recently ended a two-year term as president of Goodwill Industries in Fort Worth. A thrift store and rehabilitation center opened during his tenure. New contracts were signed to provide jobs for the disabled, including packaging for local companies, janitorial services at government buildings, and highway cleanup for the state. Hill plans to step down from Goodwill's volunteer board of directors in 1992 after 15 years of service.



**Ann Finley**

*Land Systems Division*

Finley, a senior field representative, provided a vital link for 41 employees who supported Abrams tankers in Operation Desert Storm. She handled processing, deployment, pay and benefits for Persian Gulf-bound employees and served as liaison with their concerned families. One happy duty was calling employees' families with news that none of the employees were housed in a Dharan barracks hit by a Scud missile. Her efforts earned Finley the division's Logistics Employee of the Quarter award.



**Jay Moss**

*Air Defense Systems*

Moss, a computer numerical control machinist at the Rancho Cucamonga, Calif., facility, placed first in regional, state and national machining competitions sponsored by the Vocational Industrial Clubs of America. His performances qualified him for the International Youth Skill Olympics in Amsterdam in July, where he finished ninth.



FRANK JONES

Water covered almost everything at ground level both inside and outside the Harlingen facility during last spring's flood.



# New armored vehicles outfox battlefield contaminants

Operation Desert Storm introduced a revolutionary new armored vehicle to American soldiers, one that will save lives on future battlefields. Called the Fox by Land Systems Division, this nuclear, biological and chemical reconnaissance system roams the battlefield sniffing out life-threatening contaminants.

Land Systems and Germany's Thyssen Henschel have teamed to build the Fox, which is a nuclear, biological and chemical reconnaissance system mounted on an armored, amphibious, six-wheeled vehicle. A crew of four can collect air and soil samples while safely inside the Fox. Crew members analyze the samples using a mobile mass spectrometer, and predict accurately and quickly whether or not there are any contaminants that might threaten those who enter the area.

"With the proliferation of chemical and biological weapons and the willingness of some countries to use them, the U.S. Army decided it needed a better ability to detect hazards before sending soldiers into battle," said John G. Petty, Land Systems Fox program director.

The Fox, which was researched, designed and developed by Daimler-Benz and manufactured by Thyssen Henschel, is the only operational system of its kind in non-communist countries, according to Jurgen Massmann, a member of the executive board of Thyssen Henschel. More than 1,000 of the basic vehicles are deployed by NATO armies.

U.S. forces had 60 Foxes in Operation Desert Storm; 10 more were operated by other allied forces. The 70 Foxes loaned by Germany provided added security from Iraq's chemical weapons.

None of the Foxes is in production in the United States yet. But in 1988, recognizing that the Army needed to improve its ability to meet a chemical weapons threat, Land Systems teamed as a prime contractor with Thyssen Henschel to compete for and win Army contract.

The Army's Fox program is a four-phase plan to field over 300 vehicles by the year 2000. Phase I was a three-month competitive vehicle evaluation that culminated in July 1989. The Army subsequently awarded phase two and three contracts to the Land Systems-Thyssen Henschel team in March 1990.

Phase two is for interim production of 48 slightly modified vehicles. Phase three will increase sensor capability and reduce crew members to three from four for incorporation into phase four, full-rate U.S. production in 1994 of 210 vehicles.



Fox vehicles give quick and accurate reports of nuclear, biological and chemical contaminants.

Troops can survive attacks by nuclear, chemical and biological weapons by avoiding contaminated areas, wearing bulky protective gear in those areas, or decontaminating those areas. Avoidance is the preferred alternative. Effective reconnaissance is the best way to avoid contaminated areas.

Chemical contaminants are invisible. The ability to quickly detect, identify and quantify a wide variety of contaminants and to communicate that information to friendly forces could decide the outcome of a conflict and save lives.

Previously, nuclear, biological and chemical reconnaissance was slow and tedious. Soldiers dressed in protective clothing walked through the suspect area gathering samples with crude techniques. A team could only cover about 1.5 kilometers per hour.

With the Fox, a reconnaissance team can conduct liquid and vapor sampling up to 30 kilometers per hour on a variety of terrain.

The Fox has a maximum speed of 65 mph and a road range of 500 miles. The Fox is amphibious and features twin articulated propellers at the rear that propel the vehicle up to 10 kilometers per hour

in water. The six-wheel-drive Fox has a 17.1-inch ground

clearance and can keep up with tanks and other vehicles.

Its welded armor hull is chemical agent proof and watertight. The vehicle is also protected against electromagnetic pulse, transient radiation effects on electronics, and electronic countermeasures. The crew sits in bucket seats that provide comfort needed for missions lasting 12-48 hours.

Speed, mobility, protection and armament are important because Foxes must venture ahead of main forces to look for contaminants. Armor protects the crew from small arms fire and shell fragments. Foxes are armed with a 7.62mm machine gun outside the commander's hatch.

While the vehicle can detect nuclear radiation and check for signs of biological contamination, predicting chemical agents is its strong suit. Reaching through a long rubber glove sealed to the inside of the vehicle, crew members can use a ground probe to retrieve soil samples without fear of contamination. Chemical agent detector wheels trail along the ground behind the vehicle also gathering soil samples that are heated to turn chemical agents into vapor that is sucked through a vacuum air intake and analyzed by the mass spectrometer.

Crew members can drop small flags through a rear port to warn troops of contamination. ☞ Donald L. Gilleland

## Army honors all-out Stinger effort

Air Defense Systems Division is one of 19 defense contractors to receive a citation from the U.S. Army Materiel Command for "outstanding cooperation and exceptional response" to an urgent Army request during the Persian Gulf War.

The award, presented by Maj. Gen. William S. Chen, commander-Army Missile Command, cited the division for production of Stinger anti-aircraft weapons and launchers.

During the war, Air Defense Systems stepped up activity to answer an emergency call from the Army for the latest version of software for the Stinger-Reprogrammable Microprocessor. A special team of division employees worked around the clock for 45 days to meet the Army's request.

Air Defense Systems helped deliver more than 5,000 Stinger rounds, more than 4,800 Stinger modules, 90 Stinger

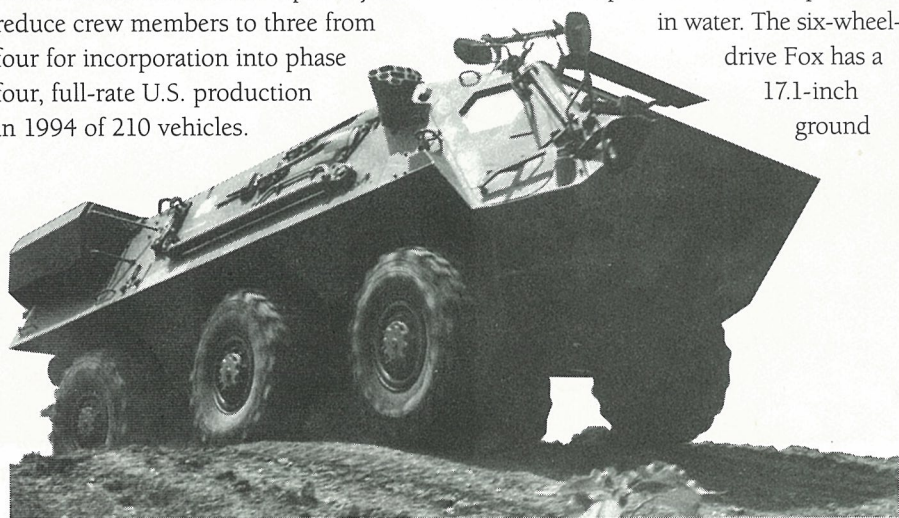
vehicle-mounted launchers and 82 air-to-air Stinger launchers during Operation Desert Shield/Storm.

At a ceremony held on the Stinger production floor at Air Defense Systems' Rancho Cucamonga, Calif., facility, Chen praised workers for helping make possible the "largest overseas deployment and subsequent combat use of Army missiles in our history.

"You met our challenge by delivering Stinger-Reprogrammable Microprocessor to the first troops deploying for imminent combat with a few hours' notice," he said. "I want to express my appreciation for your acceleration of engineering, product support, production and testing."

Chen presented the award to Bill Leonard, vice president and program director-Stinger weapon systems.

☞ Eric Solander and Jerry Littman





# Security, now more than ever

Although the Cold War is perceived to be over, the threat to classified and unclassified but sensitive technology is perhaps greater than before, according to Bill Ferrier, corporate director-security. U.S. high-technology companies such as General Dynamics are high-profile targets of information buyers.

**"T**he relaxing of international boundaries and the easing of travel restrictions, particularly in Eastern Europe before the coup in the Soviet Union, have literally opened the door for those seeking to buy or sell information," Ferrier says.

Ferrier says industrial espionage offers considerable advantages for those nations lacking technology that is key to prosperity and economic stability:

- Avoiding tremendous research and development costs;
- Saving time required for research and development;
- Undercutting more-developed nations in world markets because no research and development costs need to be figured in prices;
- Regarding weapon systems, building countermeasures into products that significantly reduce the effectiveness of the original technology.

"Technology is so essential in today's world that nations without technology may not survive," Ferrier says. "That's why some nations—even so-called 'friendly' ones—are compelled to organize wide-ranging industrial espionage programs."

Ferrier, a retired U.S. Marine Corps infantry officer whose military career included three years at Marine Corps headquarters as director of Marine Corps counterintelligence operations, says industrial espionage takes many forms:

- A foreign intelligence agent recruits an employee to hand over information for money;
- A disgruntled employee seeks revenge by giving or selling information;
- Foreign intelligence agencies intercept telephone, telex and facsimile messages either by capturing satellite signals or picking up transmissions passing through foreign government-owned telephone exchanges;
- "We shoot ourselves in the foot," as Ferrier puts it, by publishing technological advances in various magazines and trade journals.



These and other methods are used to acquire sensitive information from General Dynamics, he says. "Our first line of defense in countering this threat is our employees," Ferrier says. "Our employees' compliance with security regulations has been outstanding, as shown by our success in government inspections of our facilities."

"But security awareness goes beyond compliance. All of us have to be on the lookout for individuals doing espionage work. The human element remains the most effective means of espionage. Most theft of classified and unclassified but sensitive technology is done not by foreign agents, but by Americans employed in sensitive positions."

Signs of an agent at work include:

- Attempts to obtain information where there is no need to know;
- Excessive curiosity about others' work;
- Unauthorized removal of classified or company sensitive information from work areas;
- Cameras or recorders in the work area;
- Repeated overtime or unusual work hours not required by the job;
- Unexplained affluence.

"In many cases, it's difficult to distinguish the spy from an exceptionally hard worker," Ferrier says. "But suspicious activities, combined with job dissatisfaction and other disgruntlement, certainly provide grounds for heightened attention to an individual's actions."

Top management involvement boosts security awareness throughout a facility, Ferrier says. "When a general manager takes a personal interest in a subject, usually the follow-through reaches all levels of the work force," he says. "From a purely business perspective, it makes little sense to develop a piece of sophisticated technology only to have it compromised six months later because we failed to take the necessary steps to protect it."

## World War II Privateers still bomb, but today's targets are forest fires

The following is a condensation of Bill Heald's "Putting Out Fire with Privateers," which appeared in Fort Worth Division's *Code One* magazine.

**I**t's a losing battle, attempting to complete a fire break before the prevailing winds blow a raging forest fire into the laps of you and your coworkers. Only 300 yards away, the fire crackles threats of destruction. Relief comes with a sudden sound overhead. Just above treetop level, flying straight for you, thunders a huge four-engine bomber.

A Consolidated PB4Y-2 Privateer is en route to drop thousands of gallons of gooey fire retardant on this blaze, giving you a chance to do your job. Privateers served as U.S. bombers in the South Pacific during World War II, but this one extinguishes rather than encourages fires these days.

Through more than four and a half decades, this airplane has continued to serve, for it has always been able to find a niche in which it provided specialized service at reasonable operating costs. This versatility has saved the Privateer from the fate of so many of its contemporaries, which have been destroyed or found obscure duty as museum exhibits or, in some extreme cases, as gas station ornaments.

The birth of the PB4Y-2 Privateer can be traced to 1943, when the Navy asked Consolidated Aircraft Corp., Convair

Division's predecessor, to develop a land-based patrol bomber to support and augment Consolidated's B-24D Liberators serving in the Pacific. The Liberator, which was partially modified and designated PB4Y-1 for Navy use, was adequate for its tasks, but there was unanimous opinion that the design could be improved.

The Navy wanted more power at low altitude, heavier armament and the latest radar and electronic surveillance equipment. Consolidated engineers responded by stretching the fuselage 7 feet and replacing the familiar twin tail—the trademark of the Liberator—with a massive single vertical stabilizer, which rose 29 feet above ground level. The addition of four Pratt & Whitney 1830 radial engines gave the heavy bomber a cruising speed of 250 mph and a range of 3,000 miles.

After modifications, the plane boasted a payload capacity of 6,000 pounds. It performed in the Pacific from late 1944 to the war's end the following summer. But little did engineers know their improvements would eventually serve the plane well for freight hauling, crop dusting and fire fighting.

Seven hundred forty PB4Y-2s rolled off Consolidated's assembly line in San Diego. Hawkins & Powers Aviation of Greybull, Wyo., one of the leading contractors to furnish retardant bomber services for the U.S. Forest Service and other agencies, operates five of those

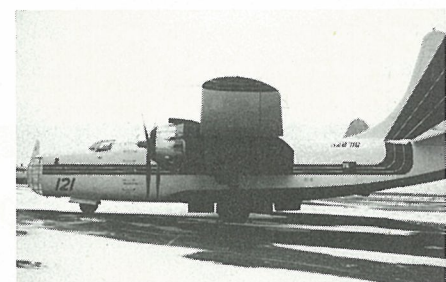
planes. Hawkins & Powers' aircraft see action all over the United States, especially during fire season from February-October.

Hawkins & Powers engineers converted Privateers that had been used for agricultural spraying into flying fire hydrants. A system was devised whereby the planes could carry thousands of gallons of retardant, dispensing all their load at once or in up to eight separate drops. The plane's Pratt & Whitney 1830 Wasp engines were considered too delicate, so they were replaced with more reliable and powerful Wright R-2600s.

The aircraft carries a two-man crew, with the pilot in complete control of the drop process—a bombardier is not necessary. The pilots must also obtain a certificate, issued by the Department of the Interior, demonstrating they have been sufficiently trained in fire retardant bombing.

While pilot skills are crucial, stifling forest fires by airborne attack also involves a healthy amount of chemistry. Different types of fire retardant "slurries" are in use and chemical companies face considerable competition in developing the best mixture to gain government contracts. Government agencies purchase the retardant and then hire companies such as Hawkins & Powers to perform the drops.

The most common type of retardant is composed primarily of fertilizer materials, such as salts, phosphates and gum



A Hawkins & Powers Privateer awaits its next mission, nearly 50 years after coming off a Consolidated Aircraft assembly line bound for action in the Pacific during World War II.

thickeners. It also contains a coloring agent that fades with time, but helps pilots monitor the accuracy of their drops. Heat-activated chemicals in the slurry help keep the fuel's moisture content high and its temperature low. This slows combustion and prevents trees' wood from releasing flammable gases that sustain fires.

The role of Privateers will most likely be reduced over the next several years as newer aircraft are developed. Hawkins & Powers is currently working on an engineering program involving turboprop-modified Lockheed Neptunes. These will be the most likely candidates to replace Privateers. When this does happen, the company will keep a couple of planes in reserve. The rest will probably end up in museums. For the time being, though, Privateers will continue to fly throughout North America, saving forests, property and lives.



# AMSEA sails fast-sealift ideas past officials

**"If anything has demonstrated its validity and its importance during (Operation Desert Shield/Storm), it is the concept of the prepositioned ship. I would think that the lessons learned are going to demonstrate that we need more of these vessels."**

**V**ice Adm. Francis Donovan made the comment shortly after war in the Persian Gulf erupted. He called the rapid deployment of prepositioning ships a critical maneuver in the swift and decisive defeat of Iraq. It was American Overseas Marine Corp.'s (AMSEA's) maritime prepositioning ships that played a key role in that initial rapid deployment.

Never before used in a major conflict, maritime prepositioning ships deployed "virtually by the textbook" while serving as a cornerstone of Marine Corps rapid deployment doctrine, Donovan told lawmakers. The ships delivered tanks, artillery, fuel, water and other supplies and troops within 10 days of the start of Operation Desert Shield, then served as bases in the Gulf.

Now there is a move under way to increase the number of prepositioning ships in the U.S. armada. It's such a move that Leland Bishop, president of General Dynamics subsidiary American Overseas Marine Corp., has been advocating.

"Desert Shield and Desert Storm have exposed to the world that a vulnerability exists in the U.S. deployment capability," says Bishop, who foresees American Overseas Marine Corp. operating additional prepositioning ships. "More prepositioning ships would decrease that vulnerability."



AMSEA's 1st Lt. Baldomero Lopez, a maritime prepositioning ship, rests at dockside.

The concern is that it took too long to get Army heavy equipment to the theater. For the most part, it was the Marines with their material delivered by maritime prepositioning ships who stood between the Iraqi troops and Saudi Arabia for the first 30 days. In response to such concerns, Secretary of Defense Dick Cheney recently noted that the postwar Middle East environment requires a capacity to get to the theater quickly and on short notice; demonstrates that the current system takes too long to move heavy divisions; and shows that the United States may want to do a better job of prepositioning.

Says Bishop: "The Persian Gulf situation demonstrated that prepositioning at sea can satisfy a fast closure requirement of 5-10-15 days. The best closure from the continental United States with fast sealift ships of 33 knots is more in

the 25-35-day range depending on the ports at both ends."

Prepositioning on land is a high risk because it isn't flexible enough to support deployment needs in the present world, Bishop says. "Further, it is vulnerable to political shifts," he says. "Just consider if prepositioned equipment had been placed in Kuwait; would it have helped Iraq rather than the U.S. and its allies?"

Bishop claims prepositioning at sea provides for fast closure capability while avoiding risks of political changes on land.

"Most agree with this assessment," says Bishop, who has briefed the Office of the Joint Chiefs, Office of the Secretary of the Defense, the Army, Navy and Marines, among others.

If a decision is made to build new prepositioning ships, Bishop claims American Overseas Marine Corp. has

the only proven design. Originally designed by General Dynamics' Quincy Shipyard, a former subsidiary, the ships proved to be cheaper to construct than converting existing ships, Bishop says.

However, some government officials are looking at designs for a new 25-knot, roll-on, roll-off ship. Each of the new ships would cost about \$300 million, according to Washington sources. Cost of the American Overseas Marine Corp. ships, which will travel at a speed of about 18 knots, is about \$175 million apiece.

"With today's reduced budget, why design a 25-knot ship that only solves the requirement issues that the 18-knot ship does," says Bishop, who is emphasizing the point to the Department of Defense. "Besides, the 25-knot ship will take two years to design and another 2 1/2 years to build. Our proven design already exists. As a result, you could build 12 of them before the first 25-knot ship would go into operation."

Marine Corps Commandant Gen. Alfred Gray agrees. He told the Senate Armed Services Subcommittee on Projection Forces and Regional Defense recently that speed should be emphasized less because "an extra 5 knots" will price the ships out of the market.

American Overseas Marine Corp. will continue to work with the Department of Defense and Congress to focus on the most effective solution for the taxpayer and the shipbuilding industry to meet the military's requirements, Bishop says. Additional prepositioning ships, managed by American Overseas Marine Corp., may be the answer.

☛ Myron Holtzman

## Super magnets could be super business

**S**ometime after the turn of the century, deep underground and inside the 60-mile rings of the Superconducting Super Collider, two beams of high-energy protons will collide, each guided to near the speed of light by huge dipole magnets. These collisions will yield new particles out of the released energy and give scientists fresh insight into the nature of matter.

Production of the dipole magnets that will make these collisions possible is a promising new business for Space Systems Division.

The Superconducting Super Collider Laboratory recently signed a contract with General Dynamics as leader with Westinghouse as follower to develop the magnets. Space Systems has begun work on the initial four-year design and development phase worth \$166 million and intends to win the lion's share of the superconducting magnet production business. Both companies will build a combined total of 587 prototype and preproduction magnets. The two firms will then compete for produc-

tion in 1994 of the remaining 8,150 magnets.

Although Space Systems is noted for its family of Atlas rockets and Centaur upper stages, its ability to build superconducting magnets is directly related to its space business.

"We got into the magnet business in the first place because of our expertise in cryogenics and because we were good at building very large structures," said Richard P. Hora, division vice president-energy programs.

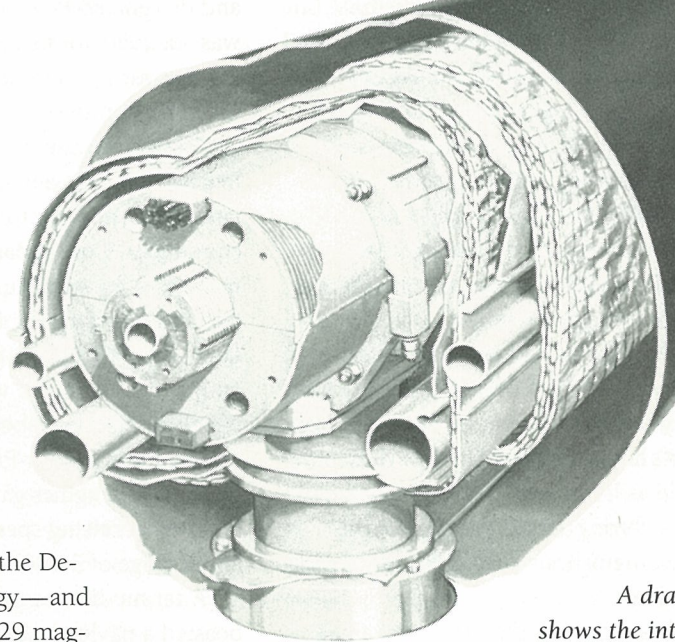
Cryogenics—the physics of production and effects of very low temperatures—plays a role in space vehicles and the Superconducting Super Collider magnets. Liquid hydrogen, which is used to fuel the Centaur upper stage, boils at 20 degrees above absolute zero. The Superconducting Super Collider magnets will also operate at a very low temperature—near absolute zero—at which the electricity that powers the magnets flows without resistance. At such temperatures, liquid helium cools the magnets. Each magnet will be 52 feet

long and weigh about 14 tons, about the weight of an unfueled Atlas II.

General Dynamics won its first magnet contract in 1976—the Large Coil Program for the Department of Energy—and went on to build 29 magnets and capture 65 percent of the superconducting magnet business over the next decade. Most recently, it built the three full-size 92-foot-long dipole magnets for the Texas Accelerator Center in support of the Superconducting Super Collider. The last magnet was delivered in 1985.

Space Systems will produce magnets in a Hammond, La., facility dedicated Aug. 8.

Meanwhile, Space Systems will continue pursuing other markets to parlay its



A drawing shows the interior of a Superconducting Super Collider dipole magnet.

core competence into additional superconducting applications. These include X-ray lithography, a process to etch silicon computer chips; MAGLEV, a futuristic transportation system; magnetohydrodynamic propulsion, popularized by the book and movie "The Hunt for Red October"; and magnetic fusion, considered the most promising alternative energy source to fossil fuels or nuclear fission. ☛ Julie Andrews



## GD focusing on defense business

**General Dynamics is minding its own business—the defense business.**

**G**eneral Dynamics' backlog has increased dramatically this year, primarily from new defense work such as the F-22 Advanced Tactical Fighter and F-16 Fighting Falcons for South Korea. That increase, coupled with the fact that defense work is what the company does best, has led management to decide that General Dynamics will concentrate on its core defense businesses. "We will not consider investments outside our core

**Related stories:**

- **Air Defense contracts** — p. 2
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defense businesses," Chairman and Chief Executive Officer Bill Anders told financial analysts in New York on Sept. 25.

The company took two major actions on those words during recent weeks:

- On Sept. 23, the company announced it had agreed to sell Data

Systems Division, General Dynamics' supplier of in-house information systems, to Computer Sciences Corp. for \$200 million.

■ On Oct. 17, General Dynamics said it would divest Cessna Aircraft Co., a leading supplier of general aviation aircraft.

"We are following through with our stated intention of focusing on our core competencies in defense," Anders said.

Although U.S. defense spending has entered what is likely to be a permanent downturn, GD expects to receive \$8 billion more in profitable new business this year than was earlier anticipated. This is a testament to the strength of General Dynamics' product franchises.

Building aircraft, missiles, submarines, tanks and other military equipment has sustained General Dynamics and its predecessor companies for nearly a century. These capabilities and skills are not easily transferred to commercial ventures, as some defense companies, including General Dynamics, have painfully discovered during the last few decades. For example, Electric Boat Division abandoned diversification attempts it tried after World War II and Convair Division stopped making commercial jet transports after losing more than \$381 million in 1960 and '61. Without a true competitive advantage, attempting to diversify into commercial markets has a very low probability of success.

(continued on page 2)

## New owner, same data service

**Data Systems Division is leaving and staying.**

**H**ow so? General Dynamics recently sold substantially all of Data Systems, its provider of in-house information services, to Computer Sciences Corp. for approximately \$200 million. But the people, equipment, and service quality General Dynamics is accustomed to will remain. Only the name and owner of the service provider has changed.

Computer Sciences is acquiring Data Systems' three major centers, 28 service sites and about 2,600 employees—who will then supply information technology services to General Dynamics for the next 10 years. The agreement for Computer Sciences to do this work represents one of the largest outsourcing contracts ever awarded for information services.

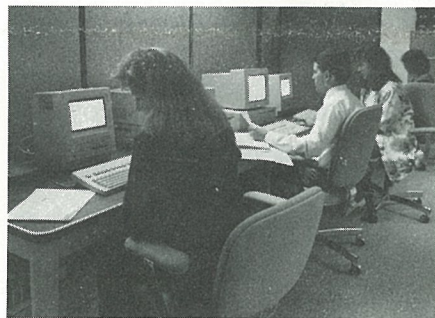
"This is a transparent transaction in many respects," said Ace Hall, corporate vice president-information systems and administrative services. "General Dynamics will see little or no difference in the information services it receives, and former Data Systems employees will notice little or no difference in their jobs."

Hall described the sale of Data Systems as a win-win-win situation for General Dynamics, Data Systems employees and Computer Sciences.

There are six benefits for General Dynamics:

**First**, the transaction gives General Dynamics access to the full resources of Computer Sciences, the largest indepen-

(continued on page 2)



FILE PHOTO

*Most of the work force at Data Systems Division will no longer be employed at General Dynamics, but will continue to provide information services to the company.*

## Cessna to be divested

**General Dynamics is divesting its Cessna Aircraft Co. subsidiary, the world's leading producer of business jets.**

**C**essna, headquartered in Wichita, Kan., employs about 5,400 people. The company will be divested through a sale, an initial public offering, a spin-off to shareholders or some other form of corporate disposition. The process may take up to several months to complete. The divestiture should have no effect on Cessna's daily operations and product development.

General Dynamics is divesting Cessna for two reasons:

**First**, Cessna is an undervalued asset. General Dynamics' defense businesses, which account for about 90 percent of

sales, overshadow Cessna, whose full value is, therefore, not reflected in General Dynamics' stock price.

**Second**, divesting Cessna is consistent with the company's intention to focus on core defense business. Over the last nine months, General Dynamics closely considered investing in other commercial endeavors such as Cessna's. With a dramatic increase in new defense business, however, General Dynamics concluded that its traditional strength was greater than first thought. Recent new defense contracts, such as those for the F-22 Advanced Tactical Fighter, Stinger anti-aircraft weapons and South Korea's F-16 Fighting Falcons, supported that conclusion. General Dynamics decided it would be better served by concentrating on its core defense businesses.

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"Rationalizing overcapacity" and emphasizing "critical mass" are keys to a sound defense industrial base.

**Rogers, McSweeney retire 4**

Vice Chairman Herb Rogers and Corporate Vice President and Convair General Manager John McSweeney end long and successful careers at General Dynamics.

**Navajos nurture quality 8**

General Dynamics facilities on Navajo tribal lands please internal and external customers with quality products.

## Incentive plan changes proposed

**T**he board of directors has authorized the scheduling of a special shareholders' meeting to report on company strategy in light of recent industry developments and to seek shareholder approval of revisions to the company's employee incentive plans.

There are two reasons for proposing changes in the incentive plans. First, the gain/sharing plan has clearly been successful in providing an incentive for increased performance. After trading at half of book value nine months ago, company stock is now trading above book value. Second, substitution of a stock option plan for the gain/sharing plan precludes any perception of bias in taking actions that might drive the stock up to its next "trigger" price.

The revised plans will even more closely align management and employee interests with those of outside shareholders. The revised plan will continue to incorporate strong incentives to enhance shareholder value and will include downside risk and increased emphasis on long-term results.

The authorization follows the company's announcement in late September that cash in excess of company needs could be returned to shareholders in any of a number of ways, such as stock buy-back, increased dividend, special distribution or self tender.

Among the proposed revisions are: the approval of a partial gain-sharing credit computed at a per-share price of \$52.0625; the substitution of a new stock option plan for the gain/sharing plan with an option price of \$52.0625; the creation of a mechanism within the corporation's savings and stock investment plan to invest any special distributions and proceeds of tender offers; and other related items.

Proxy materials detailing the proposed changes and setting the date of the special meeting were being prepared for filing with the Securities and Exchange Commission as GD World went to press.



## Focusing on defense

(continued from page 1)

In his New York speech, Anders detailed other elements of General Dynamics' strategy:

- Leverage current strengths. General Dynamics will capitalize on its research and development capability; its highly skilled employees; its modern equipment and facilities; and its strong product franchises.

- Build the financial strength and flexibility necessary to weather the declining defense environment and to fund future opportunities. General Dynamics is emphasizing better management of all operating assets as one way to reduce costs and build cash. By Sept. 30, the end of the third quarter, this approach had helped General Dynamics' cash balance reach \$600 million. The company expects its year-end cash balance after taxes to be \$500-\$600 million, without considering the divestiture of Cessna.

- Use cash in three ways. First, provide the liquidity to pay down debt, and to have the financial capacity to pay the government's claim on the A-12 in the unlikely event that General Dynamics and McDonnell Douglas lose their appeal of the government's termination of the program for default. Second, invest only in core defense businesses that generate acceptable profits. Third, rather than make risky investments in businesses outside of defense, we will return cash in excess of company needs to shareholders. This can be done in any of a variety of ways, including stock buy-back, increased dividend, special distribution or self tender.

Generating cash, using it advantageously, and leveraging current strengths combine for "the most effective strategy to benefit our employees, our shareholders and our customers," Anders said.

## Cessna

(continued from page 1)



Employees work on Citation business jets on the assembly line at Cessna.

The disposition will allow Cessna to concentrate on commercial aviation without being part of a corporate parent whose main business is defense. "Cessna is a world-class operation, and Cessna CEO Russ Meyer and his team are proven winners," said Chairman and Chief Executive Officer Bill Anders. "We and they view this as the start of an exciting and highly rewarding opportunity for Cessna's employees and customers alike."

For General Dynamics, the disposition significantly cuts debt and long-term liabilities. The deconsolidation of Cessna and its finance operations will reduce General Dynamics' long- and short-term debt by about \$240 million, its ratio of total debt to capital to 35 percent from 40 percent, and total long-term liabilities by \$545 million.

"We view a sale of Cessna as a positive development for both companies," Meyer said. "It would generate cash that General Dynamics can invest in its principal businesses. Similarly, Cessna would benefit by continuing to concentrate its resources on its product lines."

General Dynamics acquired Cessna in 1985. Cessna produces the Citation series of business jets and the Caravan series of propjet utility aircraft. Founded in 1927, Cessna has produced more general aviation aircraft than any other manufacturer. Cessna has built more than 177,000 airplanes, and has led the industry in the delivery of business jets since 1979. Cessna has delivered more than 1,825 Citations since opening its Citation production line in 1972.

Cessna also services aircraft at its Citation Service Centers and finances new and used aircraft through its Cessna Finance Corp. subsidiary. The divestiture of Cessna will include the service centers, Cessna Finance, and Cessna's McCauley Accessory Division in Vandalia, Ohio, as well as Cessna's Wichita operations.

In 1990, Cessna reported operating income of \$106 million on sales of \$716 million. Compared with the first half of 1990, Cessna increased its operating income 15.4 percent to \$45 million and sales 17.1 percent to \$390 million in the first half of 1991.

## Data Systems

(continued from page 1)

dent professional services company in the computer industry with revenues of more than \$1.7 billion. The 32-year-old company is based in El Segundo, Calif., and employs 24,000 people in 300 worldwide offices.

**Second**, as a leading company in its industry, Computer Sciences will attract and retain the highest quality information services professionals to provide service to General Dynamics.

**Third**, "we get about \$200 million for \$140 million in assets and improve our balance sheet," Hall said.

**Fourth**, the transaction permits General Dynamics to convert largely fixed data processing costs into variable costs.

**Fifth**, General Dynamics expects to pay less for information services because Computer Sciences can spread its fixed costs across its large client base.

**Finally**, selling Data Systems takes General Dynamics out of a non-core business and permits management to focus on what the company does best—design and produce weapon systems.

For Data Systems employees, the sale moves them into a company whose core business is information technology services and that has steadily increased its revenues from about \$200 million in 1978 to more than \$1.7 billion this year.

"In the long term, there will be more career opportunities for Data Systems people going to Computer Sciences," said Mike Beebe, vice president-Data Systems Western Center, who will be joining Computer Sciences. "Our staff

size at Data Systems currently depends on demand for our services by General Dynamics. Computer Sciences has shown continued growth and profit, and will want us to pursue other business. So, if General Dynamics' demand for our services fluctuates, we can hopefully offset that with outside business and over time even increase our staff."

For Computer Sciences, the purchase of Data Systems adds three large data centers, 2,600 highly qualified people and about \$350 million of first-year revenue, and nearly doubles Computer Sciences' commercial business base.

Approximately eight hundred of Data Systems' work force of 3,400 will remain General Dynamics employees. These 800 people consist primarily of software engineers developing software that is embedded in General Dynamics products.

Meanwhile, Computer Sciences will provide data center management, network operations, systems analysis, applications development and various other technical services to General Dynamics. Data Systems had been supplying similar services as part of General Dynamics since 1973.

The former Data Systems Division will become the Technology Management Division of Computer Sciences. Technology Management Division will be headed by Thomas Williams, formerly president of Applied Technology Division, Computer Sciences' largest operating unit.

## Contracts go to Air Defense

**A**ir Defense Systems Division has retained its leadership position in building Stinger anti-aircraft weapons and Phalanx shipboard defense systems by turning back other companies vying to build those products.

Air Defense Systems won a winner-take-all competition with Raytheon for a \$114 million contract to make Stingers for the Army. The division also captured 70 percent of the Navy's order to produce Phalanxes. Air Defense Systems received a \$68 million contract to build the Phalanxes, which are fast-reaction, rapid-fire, computer-controlled radar and gun systems for close-range targets.

However, 65 percent of the Navy's procurement of another Air Defense Systems product, Standard Missile, was awarded to Raytheon for fiscal year 1991 and for options in fiscal years 1992 and '93.

The Stinger and Phalanx awards resulted from an intensive divisionwide effort to trim costs and thus lower bids for competitive contracts, while still making good profits.

The Stinger contract calls for production of 4,413 Stinger-Reprogrammable Microprocessor missile rounds and 199 captive flight trainers. General Dynamics, the original designer and builder of Stinger, has received Stinger

contracts every year since 1978.

"This win is key in our efforts to eliminate the second source, and is a significant milestone toward achievement of our 1991 division operating plan," said Bill Leonard, Air Defense Systems vice president and Stinger program director.

First deliveries to Army Missile Command under the new contract are to begin the first quarter of 1993. Final deliveries are to be made the first quarter of 1994.

General Dynamics has already delivered more than 38,000 Stinger missile rounds. Air Defense Systems is under contract to build 37,621 Stinger-Reprogrammable Microprocessor missile rounds, of which 21,889 have been delivered.

The Phalanx award calls for 19 Block 1 Phalanxes and 13 ordnance alteration kits to upgrade earlier versions of Phalanx. Hardware fabrication under the contract will start late this year or early next year. Deliveries are to begin in February 1993 and end in January 1994.

Air Defense Systems has delivered more than 700 Phalanxes to U.S. and allied navies since the start of Phalanx production at the Pomona (Calif.) Facility in 1979. Phalanxes have been installed on more than 400 U.S. Navy ships and have been purchased by 10 other countries.



# Rationalizing America's defense industry

**This column summarizes the keynote address given by Chairman and CEO Bill Anders at the recent 12th annual Defense Week Conference. The full text of the speech has been mailed to all employees who own General Dynamics stock and is available to all others through local public affairs offices.**

In his remarks, Chairman and Chief Executive Officer Bill Anders charted a path for our industry to follow should defense budgets decline as expected.

Our government cannot or will not take the lead to strengthen our business because a government-mandated industrial policy is politically unacceptable to the present administration and has a poor track record in other countries, Anders said. Therefore, our industry must act by "rationalizing overcapacity" and adopting "critical mass" to ensure a strong defense industrial base.

"We need rationalization of this industry — we must reduce supply to meet demand," Anders said.

As part of the company's decision to focus on our core defense competencies, we have determined that each of our core defense businesses should have the technical, marketing and productive skills, and financial strength to be No. 1 or 2 in its area of competence. If this is the case, we will be able to supply high-quality, advanced products and services to our customers at reasonable prices, satisfactory returns to our shareholders, and more secure and rewarding jobs to our employees. Also, as part of our drive for increased competitive and financial strength, we will seek to achieve "critical mass" in all our operations. By critical mass we mean the better matching of our engineering and production capacity with our business volumes to obtain the necessary efficiencies and economies of scale to be truly competitive and financially strong. For businesses that do not meet these criteria, we are prepared to buy supplemental program volume, sell the business to another party, or exit the business as its backlog is delivered.

"Not everyone can be No. 1 or No. 2," Anders said. "Given the negative growth in our market, mediocre third- and fourth-place suppliers shouldn't be around in five years or so. Cleanly exiting an unsound business takes enlightened management and is a real act of leadership. General Dynamics is prepared to act where indicated."

The defense industry must eliminate excess capacity to become competitively strong. The government must act to make the industry a more attractive investment. In recent years, the indus-

try expanded facilities to meet the demands of a customer who was expected to spend \$400 billion or more on defense annually. But unfavorable terms and conditions of contracts and unsound business practices cut back profitability in our industry. And the sudden and unexpected decline of the communist threat dashed our optimistic projections for large defense budgets. Annual budgets are expected to be dramatically lower than projected. These factors, coupled with government policies and procedures that prop up financially weak suppliers who would otherwise leave our industry, have led to massive overcapacity. Overcapacity in turn raises our costs to the detriment of both our customer and ourselves.

While we at General Dynamics are applying our own version of the "three Rs" — rightsizing facilities, equipment and tasks to create efficiency, repositioning our resources to concentrate on our core defense businesses, and restructuring to stabilize our financial health — these three Rs will not eliminate the overcapacity that is rife throughout the industry. That's the role of rationalization, Anders said.

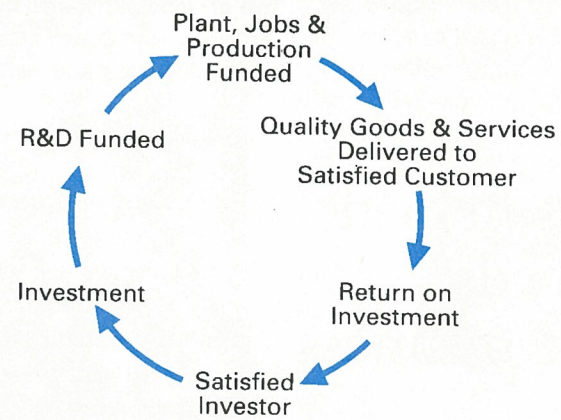
There is simply too much capacity in our industry to efficiently provide the smaller amounts of equipment and services that our customer will buy. Economies of scale can't be realized.

**The defense industry must eliminate excess capacity to become competitively strong. The government must act to make the industry a more attractive investment.**

The government's role, Anders said, is to make the defense market more attractive to investors, who provide the capital that is vital to operate our business. Actions the government should take include stopping high-risk, fixed-price development contracts, and providing higher progress payments, reasonable terms, and more direct and complete research and development funding. The government should not impede the departure of excess capacity and inefficiency from our industry; should buy long-term for the best value, rather than dual-sourcing procurement of low volumes; should stop loss-driven teaming arrangements of suppliers; and should consider modifying tax laws and contracts regarding write-offs and sale/lease-back arrangements.

Meanwhile, rationalization is fundamental to providing "good, stable jobs to retain the best research and development and production skills," Anders said. "You have the efficiency needed to deliver quality goods and services to the customer on time, and at a reasonable price. And you should have reasonable returns to encourage further investment."

Applied industrywide, rationalization and critical mass will create a sound defense industrial base for our country, our customer, our employees and our investors.



## Closed loop keeps business strong

The health of our industry depends on an unbroken business circle, Chairman and Chief Executive Officer Bill Anders said in his remarks at the *Defense Week Conference*.

"Investment, research and development, delivery of quality goods and services, reasonable return on investment, and satisfied investors create a circle," Anders said. (See illustration at the top of this column.) "If that circle, or loop, is unbroken, an industry is healthy. Break any link, and it doesn't work right — it gets sick."

The current poor health of our industry stems from a broken link in that circle: the satisfied investor. "Due to their perception of declining volumes and onerous terms and conditions in our industry, investors are demanding

more from us than other industries to keep their money in defense," Anders said. "They are heavily discounting our industry, thus making it expensive for us to obtain new investment funding."

Without these investment funds, the other elements of the business circle — research and development, jobs and efficient plants, and quality goods and services for the customer — are endangered.

Improving returns to investors is the key to closing the business circle. "If returns to investors are good, they are willing to keep their money in the circle, generating new research, funding plants and jobs, and supporting the delivery of goods and services to the customer," Anders said.

### NEWS BRIEFS

#### GD, McDonnell Douglas add Northrop to AX team

Northrop Corp., maker of the B-2 bomber, has joined the General Dynamics-McDonnell Douglas team competing to develop the Navy's AX attack aircraft.

General Dynamics and McDonnell Douglas have a head start on the AX competition because the two companies teamed to develop the Navy's A-12 attack aircraft canceled earlier this year. Northrop's B-2 experience manufacturing large composite structures and low observable technology give the AX team more advantages over its competition.

#### Applications available for college scholarships

Applications are available for General Dynamics college scholarships. The company will award three \$5,000 scholarships to outstanding students with financial need. Two \$1,500 awards will be given to outstanding students without regard to financial need. Eligible students must be children of General Dynamics employees and must be high school seniors planning to major in engineer-

ing, physics, mathematics, chemistry, computer science or business at an accredited four-year college or university. Brochures and applications can be obtained at all divisions and subsidiaries. Applications must be postmarked by Feb. 1, 1992, and sent to the program's administrator, the Citizens' Scholarship Foundation of America.

#### Air Force achieves F-16 flight milestone

Air Force Capt. William "Goose" Gosselin recently became the 1,000th pilot to log 1,000 flight hours in Fort Worth Division's F-16 Fighting Falcon.

Gosselin achieved that milestone while serving at Luke Air Force Base, Ariz. He is now assigned in Bahrain, where he is assisting that country's air force with its F-16 pilot training. Gosselin began F-16 pilot training in September 1985 and typically flies 12-15 F-16 sorties per month. He has been in the Air Force for 11 years.

Gosselin's achievement came 10 years after then-Lt. Col. Dean Stickell became the first 1,000-hour F-16 pilot.


### GD WORLD

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**Editor:** Dave Lange, corporate manager-internal communications

**Designer:** Bruce McIntosh

**Contributors:** Julie Andrews, Dan Barrett, Pete Connolly, Graham Gavert, Donald Gilleland, Myron Holtzman, Dean Humphrey, Jerry Littman, George Livesay, Pat Moritz, Karl Oskoian, Jack Price, George Salamon, Chris Schildz, Eric Solander, Peter Stamos, Joe Stout

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## Rogers helped sow seeds of core business

**A**sked his opinion of a recently graduated student in 1949, a certain associate professor at Purdue University wrote, "Probably will develop into leader of small group."

Forty-two years later, that student, Herb Rogers, has retired. A leader? Certainly. Of a small group? "I guess 100,000 counts as a small group," wisecracked Gordon England, executive vice president-aircraft programs and Fort Worth Division general manager, at Rogers' retirement dinner.

Rogers, until recently the No. 2 executive among the nearly 100,000 employees of General Dynamics, retired leaving a big mark on every one of them. During a 42-year career spent entirely at General Dynamics and its predecessors, Rogers worked on nearly all of the company's major aircraft programs. But more important, in recent years he and a few others set up the core lines of General Dynamics' business that keep paying off.

Noting the particular successes this year of two of those lines, the F-16 Fighting Falcon and F-22 Advanced Tactical Fighter, Chairman and Chief Executive Officer Bill Anders told Rogers at the dinner: "The seeds that you and others have planted have created additional work for this company—an additional \$6 billion worth of work that wasn't even planned at the beginning of the year, work that will keep a terrific number of people employed, advance technology, give our customers terrific programs, and give our shareholders decent returns. You can go to your retirement feeling really good about that."

The 66-year-old Rogers is retiring on a high note. There have been few, if any, low ones since that Purdue professor appraised Rogers' potential so modestly for a possible employer, Consolidated Vultee Aircraft Corp.

Like many of his generation, Rogers started his career late because of World War II. He served as a flight officer on B-17 Flying Fortresses, then enrolled at Purdue, at that time one of only four universities offering an aeronautical degree program.

Consolidated Vultee, the predecessor of Convair Division, had no place for Rogers at its headquarters in San Diego in 1949, so he started at the company's Fort Worth facility. There he has stayed, except for stints in San Diego and his role as a key executive at the corporate office in St. Louis from 1987-90.

Dave Lewis, chairman and chief executive officer from 1970-85, pointed out the strengths Rogers car-

ried from one increasingly important assignment to another: "He's been promoted over and over again and done a marvelous job, but he was always the same man with the same qualities. He had a deep personal interest that all the people working with him and for him came very high on his list. He had an unquestioned integrity and total honesty in everything he ever did."

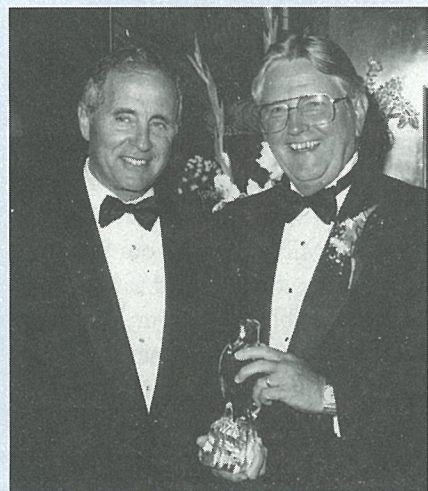
Of all the programs touched by Rogers during his career, three that stand out are the F-111, F-16 and F-22 aircraft.

The F-111, built during the 1960s and '70s, was the first big fighter program at Fort Worth. Although General Dynamics had built the F-102 Delta Dagger and F-106 Delta Dart in the 1950s, they were products of Convair's San Diego operations. Fort Worth had always been the "bomber plant," home of the B-24 Liberator, B-32 Dominator, B-36 Peacemaker and B-58 Hustler.

"Regardless of how great the 111 was and still is, the fighter community did not know Fort Worth," Lewis said. "Herb put the first team in there before the airplanes were built. So when they came in, the airplanes were delivered on schedule, on cost and at the highest quality."

In 1976, Rogers took over the F-16 program as it entered full-scale development and production. He supervised its introduction into the Air Force and, later as vice president of F-16 international programs, its entry into the international market. A measure of his success is that the Air Force, which originally wanted 650 F-16s, has ordered 2,261 planes. Another benchmark: 16 other nations have ordered 1,400 more, making the F-16 one of history's most successful international military aircraft.

As vice president and general manager of Fort Worth Division from 1981-87, he guided the company's approach to the Advanced Tactical Fighter pro-



Chairman and Chief Executive Officer Bill Anders (left) and Vice Chairman Herb Rogers hold a crystal falcon, one of the gifts Rogers received during a recent dinner honoring his retirement. Other gifts included a painting of an F-16 Fighting Falcon and an F-111 fighter-bomber, two of the company's products that Rogers worked with closely during his 42-year career at General Dynamics.

gram and its eventual teaming with Lockheed and Boeing. His involvement in new aircraft programs and the F-16 continued while he served as executive vice president-aerospace in St. Louis during 1987. After several years as president and chief operating officer, Rogers returned to Fort Worth in July 1990 on special assignment as general manager. His return to Fort Worth coincided with the start of YF-22 flight tests. In April, the Lockheed-General Dynamics-Boeing team won the competition to produce the Air Force's next-generation fighter.

Rogers, who had been vice chairman since January, sees much change ahead for General Dynamics and the defense industry, not necessarily a bad thing. "With change there is challenge," Rogers said. "And with change there are opportunities. The two go together. And with those two there is achievement and there is the excitement of the chase and success."

The chase is over for Rogers, but his successes continue every time another F-16—or in the future, an F-22—is delivered to the customer.

## McSweeney liked projects 'that couldn't be done'

**T**hirty years ago a young engineer just out of graduate school walked through the doors into General Dynamics' Pomona, Calif., plant for his first day on the job.

He remembered that his surroundings were rather Spartan: gray government-furnished desks, no carpeting and no windows.

But that didn't matter to John McSweeney. "I requested assignment to a design group vs. predesign, and I got it at Pomona," McSweeney recently recalled. "I was on top of the world working within my specialty."

Thanks in part to McSweeney's work developing the Phalanx gun system at Pomona and heading Convair Division in San Diego, General Dynamics has stayed at or near the top of the defense industry's world. That world turns now without McSweeney, who recently retired as corporate vice president and Convair general manager.

McSweeney devoted his engineering talents to a number of challenging programs at General Dynamics. Some of them, such as an early 1960s-vintage, ground-based anti-aircraft system called Mauler, never made it to market. But many others did. He lists the rush development of a radome required to field a new version of the Standard anti-aircraft missile in Vietnam as one of his proudest moments. "The bottom line for me is that I like doing things

others say can't be done," McSweeney said.

Phalanx was one of those things. The system's concept was to automatically track and shoot down airborne threats to ships at close range with a Gatling gun capable of firing 3,000 20mm shells per minute. "I started on Phalanx when feasibility money was two-thirds spent and the studies were one-third complete," McSweeney recalled. "The gun community said it wouldn't work."



Phalanx Close-In Weapon System

McSweeney served as Phalanx program director and guided the system from feasibility to introduction into the Navy. The system convinced the naysayers when it "blew a big hole in the China Lake sled track" during firing tests, McSweeney recalled. Phalanx was indeed the fastest gun in the West.

Pomona, part of Air Defense Systems Division, has delivered more than 700 Phalanxes. "The ultimate satisfaction for me is seeing the Phalanx system on every combatant ship at the Navy base here in San Diego," McSweeney said.

McSweeney's success with Phalanx and other programs at Pomona caught top management's attention and led to his appointment as Convair general manager in 1983. Under his leadership, Convair stepped up production of fuselages for McDonnell Douglas airliners and introduced one of the most decisive weapons of recent decades, the cruise missile.

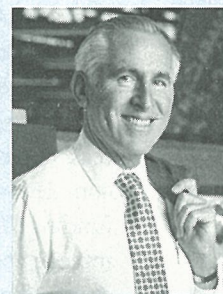
McDonnell Douglas has won sizable orders for its airliners in recent years, leading to Convair's increased production of fuselages. Convair is scheduled to deliver 41 fuselages in 1991.

The cruise missile, a concept pioneered by Germany's V-1 buzz bombs late in World War II, finally came into its own during the 1980s and

'90s as Convair's Tomahawk. NATO's European deployment of ground-launched Tomahawks helped bring the Soviet Union to the negotiating table for meaningful arms limitation talks that ended the Cold War. Tomahawks proved their worth again with highly successful attacks on Iraqi targets too heavily defended for manned aircraft during Operation Desert Storm.

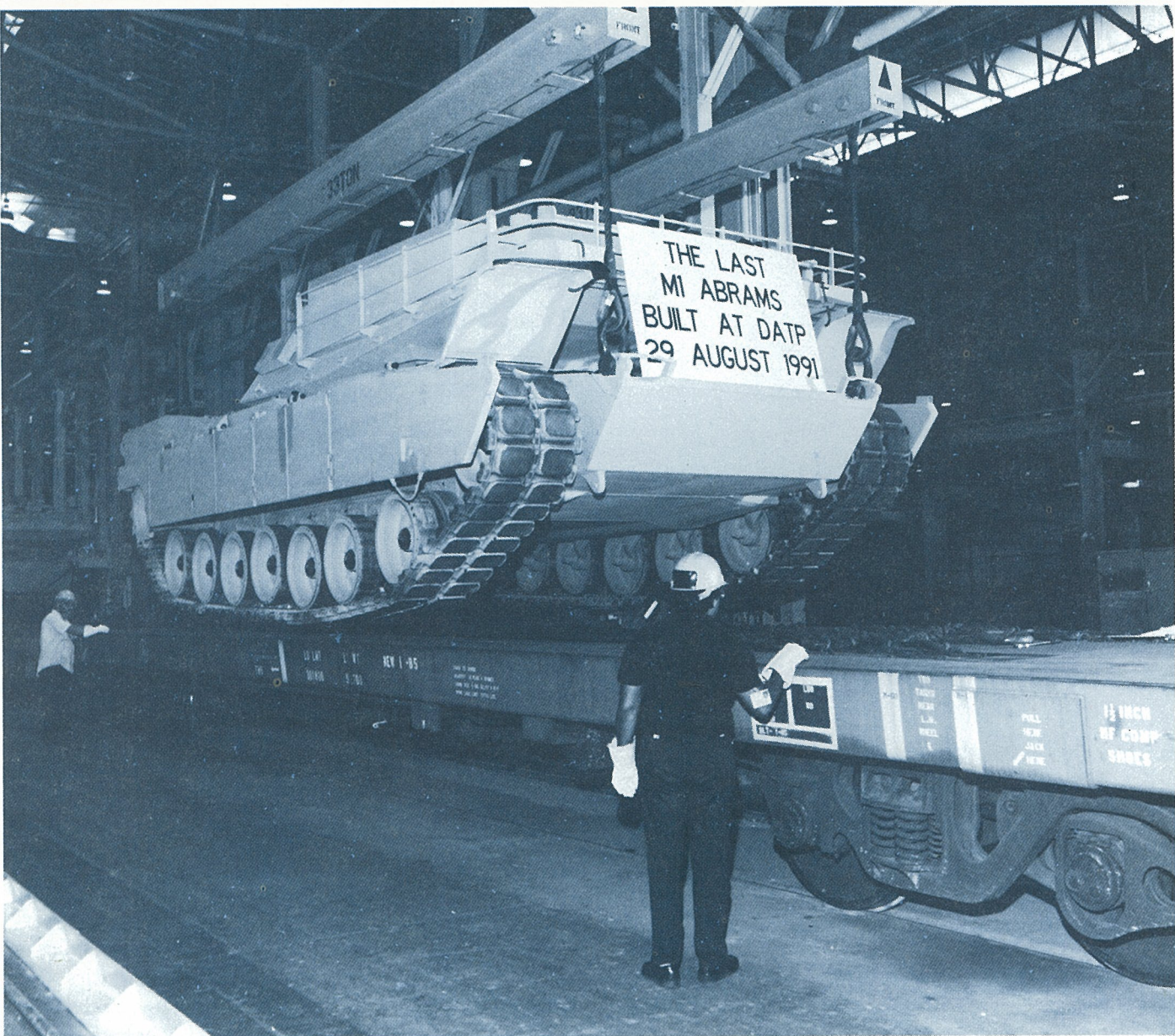
Convair has also rapidly developed the Advanced Cruise Missile, a stealthy cousin to Tomahawk for the Air Force.

McSweeney's fondest memories are the General Dynamics people he has known. McSweeney wrote this in the Convair Salaried Employees Handbook: "I still remember that my first impressions were of the many nice people ready to do their best here at Convair. That's true today."



John McSweeney





Land Systems assembly workers Reynaldo Rowe (left) and Melvin Carr move the last Abrams tank built at Detroit Arsenal Tank Plant on to a railroad flatcar.

## Detroit plant closes tank line with perfection

**T**he end of the Cold War has forced the closing of the assembly line at Land Systems Division's Detroit Arsenal Tank Plant. But the last M1 tank built at the Detroit Arsenal Tank Plant remained true to the tradition of many of the tanks that preceded it off the line.

It was a zero-defect tank.

Because of the complexity of the Army's M1 main battle tank, the concept of just one zero-defect tank was suggested by some as a lofty but impossible goal. There are more than 20,000 parts in each tank, but the last tank off the line was the 91st zero-defect tank in 1991 and the 382nd since the first M1 was fielded in January 1982.

With their layoff imminent following completion of the last tank, the assemblers at the plant could not be blamed if they had shirked their tradition of quality production.

"That would have been out of character for them," said Henry Macklin, plant manager. "They're professionals, and I'm proud of them. A zero-defect tank is characteristic of the type of folks we had and continue to have here."

The employees' sense of pride in the Abrams shows when they talk about the tank. "It's just about the best vehicle in the world," said Dennis Dingwitz, M1 road test and repair. "It proved itself big time in Desert Storm."

About 500, or half the Land Systems employees at the plant at the beginning of the year, will continue to work at the plant in machining operations supporting the fabrication and assembly of M1A1 tanks at

### Detroit Arsenal Tank Plant milestones:

- **Ground-breaking Sept. 9, 1940**
- **First production vehicle, an M3 Grant, delivered Sept. 10, 1941**
- **Delivery of 44,649 vehicles, including 15,325 M60-series vehicles and 3,460 M1s, IPM1s, and M1A1s, since 1941**
- **First M1 tank, January 1982**
- **Production of 382 zero-defect M1-series tanks**
- **First defense facility nationwide judged as Manufacturing Resource Planning Class A.**
- **First division facility recognized in the government's contractor performance certification program.**
- **Division leader in incorporation of statistical process control**

Land Systems' Lima, Ohio, plant. Completion of the last M1A1, however, meant the end for the remaining 20 assemblers.

Most of those laid off plan to take advantage of the retraining programs paid by Land Systems. Larry Larson, tank paint, said he plans to take refresher courses in modern machining techniques and return to the tank plant in that capacity in two or three months.

As he finished putting a sign on the M1A1 designating it as the plant's last tank, Larson recalled that "not so long ago" he and Roger Mahaffy painted the first two M1's to be completed there.

Paul Marshall, tank paint, will take courses in welding and blueprint reading at Macomb Community College. His 18 years at the plant included work as a repairman and inspector.

"I hate to see it end," Marshall said. "I'll miss this job like a nice lady, but we can't dwell on it. Life goes on."

Brief ceremonies marked completion of the last M1A1. Attending were James Turner, General Dynamics executive vice president, marine, land systems and services; George Psiha, vice president and Land Systems general manager; Macklin; and Land Systems vice presidents Thomas Bledsoe, Charles Hall, Howard Roberts and Eric Smith.

"The record you have set here is an example for us all," Turner said. "If there is anything that will get us more work, it is your performance here and the quality of the tanks you built."

A plaque was permanently affixed to the interior of the last tank. A replica of the plaque was presented to Turner, United Auto Workers Local 1200 leaders Richard LaLonde and Richard Lofton, and Lt. Col. Michael Leibel, Army plant commander, to be "installed as a permanent part of the facility."

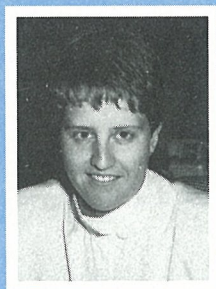
The plaque reads: "This vehicle is the last M1 built at the Detroit Arsenal Tank Plant by General Dynamics Land Systems Division. Production of these battle tanks started in September of 1981 and concluded after 3,460 units on August 29, 1991. This also represents the 44,649th tank produced over the last 5 decades at DATP. It is a credit to our work force that this, the last tank, was a zero defect tank—the 91st this year."

Said Hall, "We will remember forever the extraordinary efforts of the employees of the Detroit Arsenal Tank Plant."

☞ Jack Price

### GD PEOPLE

"GD people" is a regular feature. Employees wishing to submit information for possible use should contact their division or subsidiary public affairs offices.



#### Kimberly Alltucker

Cessna

Alltucker, a manufacturing engineer in plastics and composites, donated eight apartments owned by her family and provided necessities to Wichita residents left homeless by a tornado that struck the area last spring. People selected by the Salvation Army lived there while their houses were rebuilt. Most of them stayed one or two months, and the last family moved out in August. Alltucker is also active in the Lions Club and works with retarded children.



#### Gene Anderson

Air Defense Systems

Anderson, a design specialist at the Pomona (Calif.) Facility, recently developed and is teaching the first course of its kind on remote control technology to be offered at an educational institution. The course, given at Riverside Community College, deals with new and existing technologies to automate homes, buildings and factories. Students learn remote control technologies' impact on lifestyles and the technologies' applications to the students' jobs.



#### Mary Myers

Fort Worth

Myers, who works in contract administration at the Abilene (Texas) Facility, began her second career as a professional model at age 50. A graduate of Ruth Ann Malms' Professional Modeling School, she finished first in two categories at a recent modeling convention in New York. She is a modeling instructor and has appeared in various fashion shows. A 21-year employee at the Abilene Facility, Myers also volunteers for a number of community services, such as working with single mothers.



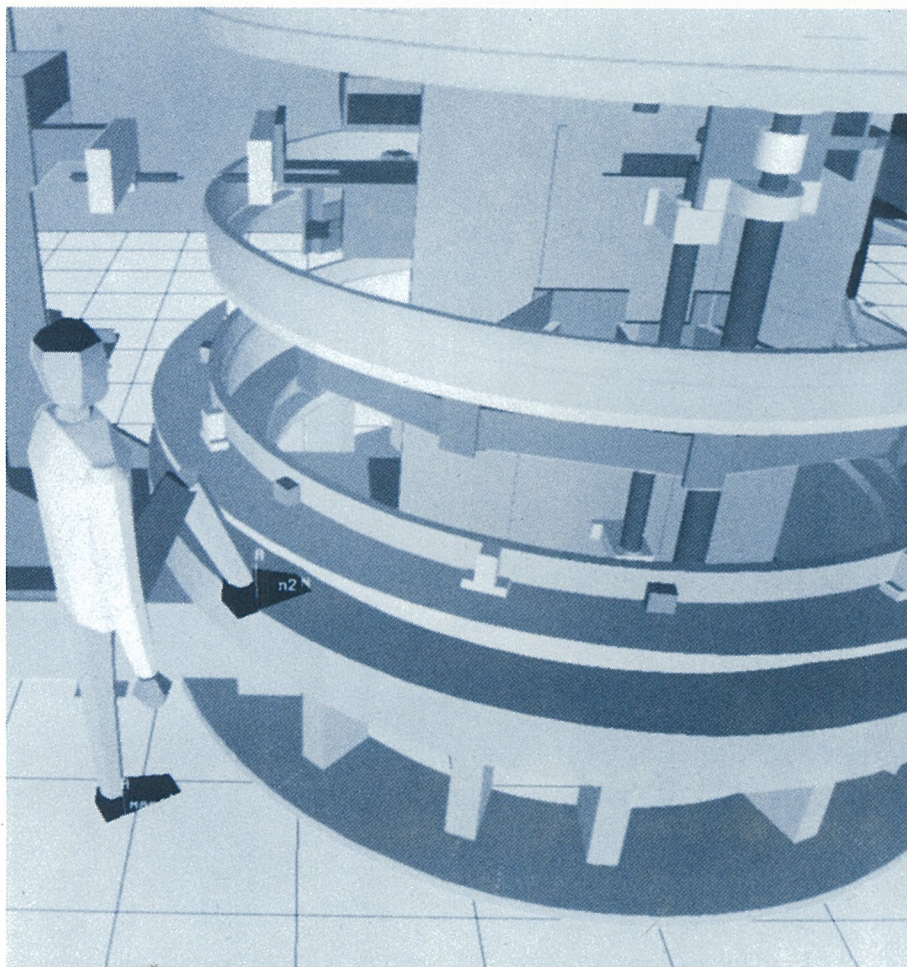
# New design methods find things that go bump in the factory

**Convair and Space Systems division employees who bend, stretch, crouch or assume other awkward positions to operate or maintain equipment should take comfort. Computerized analysis tools are coming to the rescue.**

**T**he divisions are running new software to configure equipment with the user in mind. The software combines computer-aided design with robots scaled to human size. The result is a three-dimensional view of equipment, fixtures and work stations—and the people who will use them.

This enables engineers to spot and eliminate operator problems early in the design process. For example, the computer-generated robot may not be able to use currently available tools to reach a bolt on a part that is being designed. The bolt can be moved to a more accessible location while the design is still on the computer screen, saving time on the job, money to buy a new tool, and possible muscle strains for the operator.

"These design techniques will be invaluable to engineers who must fit designs to workers without constructing mock-ups," said Mary Klement, manager-logistics planning and development at Convair. "With these design tools, engineers and designers may be able to eliminate the awkward postures, incorrect lifting techniques, and impossible reaches or climbs that have all too often been inadvertently de-



*Computer imagery shows a robot interacting with a workstation that is being designed. The color version of the image shows the operator's upper right leg in red, meaning the leg has bumped against hardware.*

signed into equipment or structures."

This design approach also helps the customer who uses products made by Convair and Space Systems. Products are easier to assemble in the factory, making errors less likely and quality higher. Once in the field, the products are simpler to service because they are

designed for easy access and maintenance.

There are two software programs, the Plant Layout Analysis Tool and the Supportability Analysis Workstation System, that incorporate robots with computer-aided design. The programs resulted from research by Convair,

Space Systems and Data Systems.

The features of this design approach include:

- Taking into account various employee sizes. The programs can create robots ranging from a female in the fifth percentile of size — very small — to a male in the 95th percentile — very large.
- Determining clearances between hardware and humans. When a body part would collide with hardware, the affected body part turns red on the computer screen.
- Eliminating hidden hazards. The robot is placed with equipment as in real life. The equipment becomes invisible on the screen when a body part passes in front, revealing possible problems. The work position can also be viewed from several angles, including the operator's perspective, again showing problems that might not be obvious from traditional two- or three-dimensional design techniques.

Space Systems is using this approach to design resistance welding stations for Atlas/Centaur launch vehicles. Convair is doing the same on the Advanced Cruise Missile Variant program and its proposal to build parts for the McDonnell Douglas MD12X airliner.

These improvements are consistent with industrial ergonomics, the study of how humans interact with equipment on the job. The companywide ergonomics working group encourages divisions and subsidiaries to use ergonomics to improve efficiency, quality, safety and health.

## Egypt's Abrams tank plant on track for January start-up

**Land Systems Division recently rolled over three major milestones to coproduce M1A1 Abrams tanks with Egypt, bringing the Egyptian Tank Plant closer to fabricating and assembling the tanks.**

**F**irst, Land Systems experts reviewed and approved the Egyptian Tank Plant's processes and procedures. The second milestone was the successful Integrated Logistics Support In-Process Review. The third was a coproduction In-Process Review.

Chairman and Chief Executive Officer Bill Anders recently inspected the Egyptian Tank Plant.

Egyptian coproduction is Land Systems' second-largest business venture. It will extend into the late 1990s with construction of 555 M1A1 tanks at the Egyptian Tank Plant.

In six increments over six years, the scope of the Egyptian Tank Plant changes from assembly to flame-cutting of armor and fabrication of hull and turret structures. General Dynamics

hopes the success of the Egyptian program will lead to other foreign sales of the Abrams tank beyond the year 2000.

To accomplish the first milestone, a team of experts representing Land Systems manufacturing, quality, industrial engineering, configuration management, and the tank program office interviewed Egyptian and General Dynamics-Cairo teams in Egypt. The Land Systems group also researched the program's progress.

Land Systems team leader Tony Plunkett, manager of manufacturing programs, said that both "results of the program to date and the Egyptian Tank Plant are very impressive." Having found no critical program deficiencies, the team gave a green light to production, which is scheduled to start next January.

"The team did a very thorough job," said Greg Tomaszewski, Land Systems Egyptian coproduction deputy program manager. "We gave them complete access to the entire program at all locations in the U.S. and Egypt. Their findings confirmed our targets for improve-

ment and recognized our accomplishments."

J.S. Acharya, director of General Dynamics Services Co. tank programs in Egypt, added that the team "performed a valuable task for us. The results were positive and all their recommendations, when implemented, will add value to the program."

During the second milestone, a team of General Dynamics, government and Egyptian representatives discussed training, technical manuals, field service support, the freight-forward-management system and vehicle test equipment. Maj. Gen. Saleh El-Hadidi, director of the Egyptian Armor Department, and five other Egyptian generals and colonels attended the Integrated Logistics Support In-Process Review.

"There were some critical activities that we (the U.S. government) wanted to see accomplished, like establishment of the first unit equipment date, the fielding schedule, and a detailed logistics milestone schedule," said Bert Liptak, U.S. Government Coproduction Office, of the Integrated Logistics Sup-

port In-Process Review. "We were very pleased with these topics being successfully briefed."

For the third milestone, more than 90 Egyptian, General Dynamics and U.S. government representatives met for three days at Land Systems' Sterling Heights, Mich., office to review the program. This was the sixth such review. Participants included Egyptian Tank Plant Chairman Moustafa Kamel Giratalla; Mohamed Tamami, chairman of Egyptian Factory 100; Col. Michael Neuman, commander of the U.S. Army Watervliet Arsenal; Lt. Col. Harold Corker of the U.S. Embassy in Cairo and Office of Military Cooperation; Simon Honess, General Dynamics Services Co. vice president; and Howard Roberts, Land Systems vice president and M1 programs director.

"These three major milestones clearly demonstrate the quickening pace of the coproduction program and the nearing of Egyptian Tank Plant tank assembly," Tomaszewski said.

➤ Jack Price



# Katz and dogs keep workplace drug-free

**L**arry Katz brought the yellow Labrador, Max, around the corner. As he approached the plywood boxes, Max began sniffing and quickly moved from box to box. Max stuck his nose all the way inside the third of four boxes, then sat down and looked anxiously at Larry. Larry smiled and gave Max the reward for his hard work . . . a tennis ball.

The scenario was part of the demonstrations Katz recently conducted for Electronics Division employees on the drug-detecting dog program Electronics started last summer.

Katz is the owner of BioSensors Inc., a San Diego-based company specializing in drug-detecting dog programs. BioSensors has been employed for similar work by utilities, oil companies, other defense contractors and a chain of hotels.

"Statistics have found that 10 to 20 percent of the working population in the United States uses illegal drugs," Katz said. "Electronics has made it clear to us that this program is designed to deter the possession of illegal drugs on company property and ensure that Electronics employees have a safe place to work."

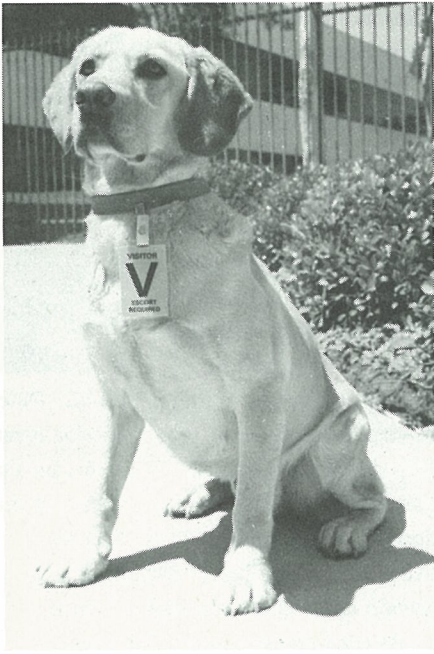
That was the intention of the program from the beginning, according to John Wickersham, Electronics vice president - human resources. A task force developed the companywide policy to support General Dynamics' existing alcohol and drug program.

The task force, which included representatives from Convair, Space Systems, Electronics, Data Systems and the corporate office, was formed last year and chartered to develop a drug detection dog program for the corporation. The task force visited and interviewed several companies that use drug-detecting dogs and considered their experiences in creating the program. Electronics was the first division to start the program following publication of the Corporate Security Manual's "Drug Detection Dog and Equipment Procedures." Implementation guidelines included employee demonstrations as well as written notice to all employees before the actual use of the drug detection dogs in the workplace, according to Dick Ritz, manager-industrial security at Electronics. "I want to assure each employee that the procedures are designed to be non-threatening and in accordance with federal, state and local laws," Ritz said.

"The dogs are completely impartial," Katz said. "They don't care about your gender, race or position in the company. They don't moralize about drugs. All they know is that if they find something, they get their tennis ball."

BioSensors uses Labradors and golden retrievers, dogs who are friendly and love to play ball. In fact, a love for playing ball is a prerequisite for the job, since the dog's reward is a tennis ball.

A dog can differentiate between 600



Max, one of the most unusual visitors to Electronics in recent years, noses around the premises to promote a drug-free work environment.

odors on every breath it takes, Katz said. When the dog does identify an odor as one of several drugs, it is trained to get as close as possible to the source of the odor, and sit down—no digging, barking or jumping.

The dogs started work last summer at Electronics. They have staged four "successful" searches—defined as those that found no drugs, because therein lies the whole purpose of the program: deterrence and a drug-free work environment.

☞ Kevin McNulty

# Savings bond drive posts 12-percent gain

Participation in the U.S. Savings Bonds program at General Dynamics has soared nearly 12 percent this year. More than 6,200 new participants have raised the corporatwide percentage of employees in the program to 78 percent. That is just 2 percent under the highest mark for the last 10 years.

"This increase shows our employees' high levels of patriotism and financial sense," said Jim Mellor, president and chief operating officer. "The quick and decisive victory in the Persian Gulf war, and the great success of our products in the war, raised our employees' pride in America. In addition, the substantial recent declines in money market rates have made Savings Bonds a very competitive investment opportunity."

The bonds, which pay 6.38 percent interest, are purchased through payroll deductions.

Convair Division showed the biggest increase among the company's divisions and subsidiaries. Convair welcomed 2,053 new savers and jumped its participation from 74 percent to 96 percent. Cessna and Space Systems each improved 12 percent. American Overseas Marine Corp. and Electronics each increased 9 percent.

Convair coupled its bond drive to Operation Desert Storm. Convair's Tomahawk cruise missile played a pivotal role in the war, so the division used a bond drive logo of an American eagle releasing a Tomahawk toward a storm in the desert.

Norm Tipton was Convair's bond drive chairman. His principal team leader was Pamela Sievers, who organized and trained the team that ran the drive. Management support throughout the campaign was exceptional, Tipton said. For example, Don Hannabarger, director-off-site manufacturing, traveled to Convair's Imperial Valley facility to encourage Savings Bond purchases. The result: Imperial Valley's participation in the Savings Bond program rose from 32 percent to 100 percent.

# Marblehead toasts Duggan's life of service

**M**arblehead Lime Co. recognized a lifetime of volunteerism when it recently presented its Community Service Award to Francis Duggan.

Duggan, manager of contractor sales at Marblehead's Powell & Minnock Brick Works, has been part of the Boys and Girls Club of South Boston nearly all of his life. Duggan says he grew up there, and has served the club as an adult for more than 30 years as a coach, counselor and fund-raiser.

"The club gives kids a chance," says Duggan, who learned to play basketball there and went on to play the sport at Boston College, where he was named to

the school's Hall of Fame. "It exposes them to experiences that build their character and gives them an outlet they don't get anywhere else. It's like a home away from home."

Duggan was named the club's Man of the Year in 1987 and has been one of the club's strongest supporters. "Fran's history with the club and the city of Boston is legendary," says Bob Monahan, the club's director of operations. "I am grateful to General Dynamics for its recognition of Fran's commitment to the community and for its generosity."

The Community Service Award, a \$1,000 grant that will go to the club's

basketball program for children ages 6-18, was given to Duggan during a special presentation from Boston Mayor Raymond Flynn. Flynn, a former club Man of the Year and a basketball All-American at Providence College, credited his basketball success to Duggan, his club basketball coach.

☞ Peter Stamos

# Backlog booms in third quarter

General Dynamics' total backlog rose 22 percent in the third quarter ended Sept. 30, while income from continuing operations increased 7 percent over third quarter 1990. Backlog for the year is up \$8 billion.

Funded and unfunded backlog totaled \$25.8 billion, an increase of \$4.6 billion over the second quarter. While receipt of the F-22 Advanced Tactical Fighter contract by the Lockheed-General Dynamics-Boeing team accounted for the largest part of the increase, a significant number of other important wins contributed.

Earnings from continuing operations reached \$64 million, or \$1.53 per share, an increase of \$4 million over third quarter 1990. The company's intention to divest Cessna Aircraft Co. resulted in restatement of all financial reports to show Cessna's results as "discontinued operations." Earnings from continuing and discontinued operations totaled \$71 million for the quarter, \$3 million more than in third quarter 1990.

SSIP			
Annual rate of return for the 12-month period ending:	Sept. 1989	Sept. 1990	Sept. 1991
<b>Salaried</b>			
Government bonds .....	8.5%	8.9%	10.9%
Diversified portfolio .....	34.5%	(11.7)%	31.6%
Fixed income .....	10.4%	10.1%	9.8%
<b>Hourly</b>			
Government bonds .....	8.6%	9.0%	10.6%
Diversified portfolio .....	35.4%	(11.8)%	31.5%
Fixed income .....	10.4%	10.1%	9.5%
GD stock closing price:	\$58.12	\$23.62	\$46.37
Annual rate of return for the 12-month period ending:	Oct. 1989	Oct. 1990	Oct. 1991
<b>Salaried</b>			
Government bonds .....	9.1%	8.5%	10.8%
Diversified portfolio .....	29.5%	(11.0)%	35.1%
Fixed income .....	10.4%	10.1%	9.9%
<b>Hourly</b>			
Government bonds .....	9.3%	8.5%	10.5%
Diversified portfolio .....	30.3%	(11.1)%	35.0%
Fixed income .....	10.4%	10.1%	9.6%
GD stock closing price:	\$52.50	\$23.87	\$52.13



# Navajos, GD mark 24 years of profitable partnership

**General Dynamics' relationship with the Navajo Nation has flourished for almost a quarter of a century. The connection has benefited both parties.**

**Facilities at Fort Defiance, Ariz., and the Navajo Agricultural Products Industry (NAPI) plant in Farmington, N.M., have produced quality work that has enhanced the company's image with the Department of Defense and the Navajo community.**

**The following stories detail the two General Dynamics facilities and a community service project with the Navajo Nation.**

**Stories by Myron Holtzman**

**W**hen General Dynamics wanted to expand its electronics assembly work at Pomona Division, the company was attracted to the Navajo reservation, the Navajo heritage of high-quality craftsman-

ship, and the abundant work force, land and buildings.

Thus, in 1967, General Dynamics turned to Fort Defiance, Ariz., to manufacture electronic components for the Redeye missile.

The company negotiated a 10-year agreement with the Bureau of Indian Affairs to lease buildings and equipment from the Navajo Tribal Council to help defray the costs at Fort Defiance. The operation was the first cooperative venture for a major corporation on Navajo lands and continues to thrive.

As the defense budget fluctuated throughout the years, so did employment at Fort Defiance, reaching a high of about 500 in the mid-1980s. Today, Fort Defiance employs 180 people; 99 percent are Navajos.



*Elouise Dale, a senior production assembler, handles a part for the Phalanx gun system at the Fort Defiance Facility.*

The facility is still owned by the Navajo Nation and operated by Air Defense Systems Division under the lease agreement with the Navajo Tribal Council. The employees assemble circuit cards, electromechanical assemblies, electrical harnesses and launch tubes for Air Defense Systems' California and Arkansas plants.

"Navajos have always felt they can do anything," says Mike Enfield, manager-human resources of the Fort Defiance and NAPI plants. "They are a very dedicated people. They want to work and to develop economically."

When General Dynamics first leased the 26,000-square-foot Fort Defiance facility from the Navajo Nation, manufacturing components for the Redeye missiles kept employees busy. But a downturn in the defense budget in the mid-1970s forced the facility to seek commercial outlets. Fort Defiance turned out circuit cards for the Fairchild Polaroid camera, audio and video circuit boards for Ampex Corp. and National Cash Register, and other commercial items.

The facility was expanded to 46,000 square feet in 1984 to handle additional work when Standard Missile production increased. Now approximately 98 percent of Fort Defiance's work consists of manufacturing round-wire and flexible harnesses for the Standard, Stinger, Sparrow and Rolling Airframe missiles and the Phalanx gun system.

"Most of the work load is labor-intensive," says Gordon Vanas, Fort Defiance plant manager. "We have very little automation and are dependent on the employees' skills throughout the manufacturing process."

Fort Defiance is committed to total quality management, accord-

ing to Vanas.

"Since adopting total quality management concepts in 1988, Fort Defiance has demonstrated unmatched quality in our harness work," he says. "Typically, harness workmanship averages 99.9 percent acceptance rates, with many work teams experiencing zero-defect months."

The decreasing defense budget is prompting Fort Defiance to look for business from other divisions and the commercial market. The facility is performing some harness work on the M1A2 Abrams main battle tank for Land Systems Division and has sent brochures to divisions within the corporation and to other small businesses.

## Chinle library is booked up

A semitrailer recently pulled into the parking lot of the Chinle Unified School District on the Navajo reservation in Chinle, Ariz. The huge vehicle was loaded with books and earmarked for the new Chinle Family Literacy Center/Community Library. The facility opened recently with the help of General Dynamics and its employees.

"Books are still coming in," says Beth Witt, assistant director of the school district's federally funded education program and coordinator of the library project. "The semitrailer was filled with books donated by Penguin Publishing Co."

The library, generated through a book-donation program started by General Dynamics employees, officially opened in July with a dedication ceremony attended by several hundred residents.

The theme of the dedication was "parents are the first teachers." "Our goal is to make parents more aware of the vital role they play in the education of the children," Witt says. "The importance of genuine parental participation in the education of their children cannot be overemphasized."

The district has issued about 1,000 library cards, Witt says. "Things have gone extremely well with the library project—probably better than anyone imagined," she says.

The program was originally conceived when George Salamon, corporate manager-editorial services, wrote a story about the area's plight for the company's *Together* brochure. The idea of donating books was presented to General Dynamics management and "The Great Chinle Bookout" was approved. Company employees donated 28,000 books and magazines.

Other organizations heard of the project through newspaper, radio and television reports and have also sent books to Chinle.

The project, meanwhile, has the full support of the Chinle school district. The district sent notes home with students listing the library's hours and urging parents to send their children to the library to do homework or receive tutoring.

Workshops for parents on subjects such as substance abuse prevention, satanism awareness, dental health and hygiene, parenting skills, and child abuse and neglect also are part of the program.

"Adult education is a big part of our plans," Witt says. "We're thankful that now we have the resources to do it."

## NAPI produces parts, pride

Rising out of vast agricultural lands near Farmington, N.M., is an industrial plant that looks as much out of place as a cornfield in downtown Detroit.

But General Dynamics has carved out an installation that has become as essential to the Navajo community as the potato, bean and alfalfa fields that surround it.

"Everyone takes great pride in the facility and the work they are doing for the company," says Mike Enfield, manager-human resources for Farmington's Navajo Agricultural Products Industry plant. "This is one of two General Dynamics facilities on the reservation that satisfies the government's criteria for a Small Disadvantaged Business."

The plant, started several years ago, employs 142 people. About 95 percent of the work involves electromechanical subassembly of the Stinger-Reprogrammable Microprocessor anti-aircraft weapon. The plant also performs circuit card assembly for the Rolling Airframe Missile and sub-assembly of Air-to-Air Stinger.

The assemblies are then shipped to the Rancho Cucamonga (Calif.) Facility of Air Defense Systems Division for testing and final assembly.

General Dynamics chose the New Mexico site because of the competitive wage rates and the company's outstanding relationship with the Navajo tribe at its Fort Defiance, Ariz., facility, which has been operating since 1967.

"The Navajos have an excellent work ethic and perform high-quality work," says NAPI Plant Manager Norm Alter.

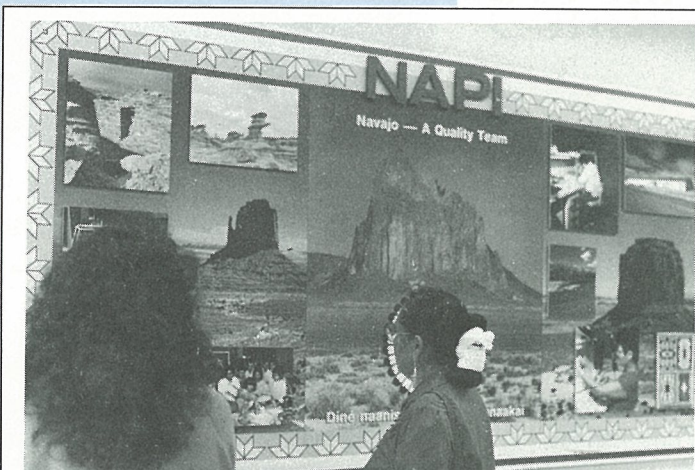
The Navajo Nation funded the construction of the \$3 million, 30,000-square-foot building just south of Farmington and spent another \$2.8 million on equipment. To defray the cost of both, General Dynamics agreed to a 15-year leasing agreement on the building and a six-year lease-back of the equipment.

The facility is working hard to solve two employee issues, child care and transportation.

A child-care center was recently opened by the Navajo Nation, the county and General Dynamics. The center, across from the plant, is operated by the Huerfano chapter of the Navajo Nation.

The plant also is working out a busing system for its employees who live in Shiprock, N.M., 30 miles away. The cost of transportation has been almost prohibitive for the employees in Shiprock, who make up approximately 60 percent of the plant's work force. Absenteeism had been a result.

"We're working things out," Alter says. "We're proud of our employees and the work they are doing."



*Visitors to the Navajo Agricultural Products Industry plant are greeted by a collage of images showing Navajo sites and Navajo employees.*

DENNIS TAYLOR